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**INTERNATIONAL UNION OF PURE
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**INFORMATION BULLETIN
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INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

President	—Dr. R. W. CAIRNS (USA)
Vice-President	—Prof. G. SMETS (Belgium)
Secretary General	—Prof. G. OURISSON (France)
Treasurer	—Prof. O. HORN (Federal Republic of Germany)

IUPAC Secretariat — Bank Court Chambers,
2/3 Pound Way, Cowley Centre,
Oxford OX4, 3YF, UK
Telephone - Oxford 770125 & 772834
Telegrams — IUPAC OXFORD

IUPAC INFORMATION BULLETIN

The Bulletin provides a news medium for the various activities of IUPAC, especially of its 50 or so committees which deal with chemical topics needing regulation, standardization or codification. It carries advance information on forthcoming symposia which are to be sponsored by IUPAC together with reports of such meetings which have recently taken place. Coverage is also given to projects in which IUPAC is collaborating with other international organizations.

Two series of Appendices to the Bulletin are issued:

- (i) Appendices on Provisional Nomenclature, Symbols, Terminology, and Conventions
- (ii) Technical Reports

Publication of the present double issue (Nos. 52/53) of the Bulletin has been delayed from 1976 and we apologize to subscribers. In 1977 only one issue of the Bulletin will be published, viz. No. 54: the annual subscription will be US-\$12.00 (£6.00) inclusive of the two series of Appendices and postal charges (surface). Special airmail subscription rates have now been discontinued.

Subscription orders may be placed direct, or through an agent, with IUPAC's official publisher Pergamon Press Ltd., Headington Hill Hall, Oxford OX3 0BW, UK, or with its overseas offices/agencies.

29TH IUPAC GENERAL ASSEMBLY*

WARSAW, 12 - 21 August 1977

Accommodation and Travel

Details concerning reservation of accommodation and various travel proposals have been distributed to National Adhering Organizations, Associated Organizations, and to Members and National Representatives of IUPAC bodies. All queries regarding travel and hotel accommodation should be directed to Trans World Conference Organisers Limited, 142/144 Oxford Road, Cowley, Oxford OX4 2DZ, UK; Telephone: Oxford (0865) 774051, Telex: 83435 TWCO Oxford.

Visas

Prospective participants have been advised to check at the Polish Consulate/Embassy in their respective countries on the necessity to obtain an entry visa to travel to Warsaw. IUPAC recommends that application for a visa should be made no later than three months in advance of the General Assembly, and if a visa is not granted by one month prior to departure the IUPAC Secretariat should be notified by the applicant without delay.

Schedule of Meetings

Subject to last minute changes the schedule of meetings is as shown on the following pages. All meetings will be held in the Palace of Culture (Palac Kultury i Nauki), Marszałkowska (see map). Details of provisional meeting rooms and times of meetings are included in the schedule.

Secretariat

Throughout the Assembly the IUPAC Secretariat will be located in the Palace of Culture, provisionally on the 19th floor in rooms 1906 and 1905; the telephone number is Warsaw 20-06-97. The main telephone number of the Palace of Culture is Warsaw 20-02-11 and the extension is 2058.

*Attendance is restricted to elected Members of IUPAC bodies, National Representatives, and delegates from Associated Organizations.

The Secretariat will be open daily and provide typing, photocopying and other services to assist Assembly participants in their work.

Any queries concerning the daily organization of the Assembly should be referred to the IUPAC Secretariat in room 1906.

Registration will take place at a special IUPAC desk in the foyer of the Palace of Culture. This desk will be manned for the duration of the Assembly. Participants on registration will receive up-to-date information on Assembly arrangements.

Medical Facilities

Within the Palace of Culture are located a doctor and a dentist. The doctor is situated in rooms 2108 and 2109 and the telephone number from outside the Palace is Warsaw 20-02-11, extension 2043 and 2246. If a doctor is not available in the surgery and an emergency occurs, from within the Palace dial 0999, from outside the Palace dial 999. The dentist is located in rooms 2106 and 2107 and the extension within the Palace is 2006.

Weather

In August the weather can be varied. The average daytime temperature is 25°C, the nights are cooler.

SCHEDULE OF MEETINGS

The Schedule of Meetings given on pp. 5 - 14 is correct as of 22 April 1977. Alterations, if any, to the Schedule will be notified to participants in Warsaw during the General Assembly.

LOCATION OF MEETING ROOMS

The letter(s) in the Schedule (pp. 5 - 14) refer to the room/hall in which the meeting will take place. A complete list of meeting room locations will be provided in Warsaw to participants. Whereas every effort will be made to adhere to rooms as codified in the Schedule, some changes may have to be made to suit the host country.

SCHEDULE OF MEETINGS FOR 29th IUPAC GENERAL ASSEMBLY

(*Denotes Joint Meeting)

Meeting of	August	Friday 12	Saturday 13	Sunday 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19	Saturday 20	Sunday 21
Council									10-12, 30 14-18 (S.W.)		10-12, 30 (S.W.)
Bureau								9-12 14-18 (280h)			14-15 (280h)
Executive Committee							9-12 14-18 (1907)				15-16 (280h)
Division Presidents			14-16* U		18-20 BB						
CHEMICAL Planning Committee					9-12 BB						
Committee on Publications		9-12 14-17 D		14-17 S	9-12 14-17 G						
Committee on Teaching of Chemistry (Officers only)					9-12* EE						
Coordinating Committee for Analytical Methods						16, 30-19, 30 B					
Finance Committee											
Interdivisional Committee on Nomenclature and Symbols		9-12 14-17 L				9-12 14-17 AA				9-12 14-17 L	

Meeting of	August	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Commission on Automation and Commission V.3		12	13	14	15	16	17	18	19	20	21
Commission on Quantities and Units and I.6					17-18* N	16-18* C					
Commission on Quantities and Units and V.4							17.30-18.30* N				
Commission on Quantities and Units and I.1			17-18* N								
Commission on Quantities and Units and I.5				17-18* N							
Commissions on Toxicology and Air Quality					10.30-12.30* C						
Clinical Chemistry Section Open Meeting							9-12* K				
PHYSICAL CHEMISTRY											
Division Committee		9-13 14-18* C					9-12* 14-18 C				
Commission I.1: Physicochemical Symbols, Terminology, and Units		9-12 BB 17-18* N	14.30-17.30* C	9-12* EE 14.30-16.30* HH	14-17 BB						
Commission I.2: Thermodynamics and Thermochemistry		9-13 14.30-17.30* C	9-13 14.30-17.30* C	9-13 14.30-17.30* C	9-13 14.30-17.30* C	9-13 15-17* O					
Subcommittee on Plasma Chemistry			14.30-17.30* C								
Subcommittee on Thermodynamic Tables				9-12 14-17 U	14.30-17.30* C						

Meeting of	August	Friday 12	Saturday 13	Sunday 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19	Saturday 20	Sunday 21
Commission I.3: Electrochemistry			9-12 14-17 B	9-12 14-17* B HH	9-12 14-17* B L	9-12 14-17 B					
Commission I.4: Physicochemical Measurements and Standards		9-12 14-17* J		9-12 14-17* J	9-12* 14-17 J						
Subcommittee on Calibration and Test Materials		14-17* J		14-17* J	9-12* J						
Commission I.5: Molecular Structure and Spectroscopy		9-12, 30 14-17, 30 DD		9-12, 30 14-17, 30 DD	9-12, 30 14-17, 30 DD	9-12, 30 14-17, 30 DD					
Commission I.6: Colloid and Surface Chemistry		9-12 14-17 HH	9-12 14-17 HH	9-12 14-16* HH	9-11* 11-13 14-16* HH	9-10 10-13* 13-12 14-17 HH					
Division Committee and Commissions' Chairmen		14-18* C					9-13* C				
Commission I.1, II.1 and Officers of V.3 and Committee on Teaching of Chemistry					9-12* EE						
Commission I.1 and Commission on Quantities and Units in Clinical Chemistry			17-18* N								
Commissions I.1 and I.2				14, 30-17, 30* C							
Commissions I.1 and I.6					14, 30-16, 30* HH						
Commissions I.2 and Interunion Commission on Biothermodynamics										15-17* O	
Commission I.2 and Subcommittee on Plasma Chemistry			14, 30-17, 30* C								

Meeting of	August	Friday 12	Saturday 13	Sunday 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19	Saturday 20	Sunday 21
Commission I.2 and Subcommittee on Thermodynamic Tables				14-16* HH	14-30-17.30 C						
Commissions I.3 and I.6				14-16* HH							
Commissions I.3 and V.5				14-17* L							
Commission I.4 and Subcommittee on Calibration and Test Material			14-17* J	14-17* J	9-12* J						
Commission I.5 and Commission on Quantities and Units in Clinical Chemistry				17-18* N							
Commission I.6 and Chairman only of Commission II.2						10-11* HH					
Commission I.6 and Commission on Quantities and Units in Clinical Chemistry					17-18* N						
Commissions I.6 and I.5						17.30-19.30* DD					
Commissions I.6 and IV.1						9-11* HH					
INORGANIC CHEMISTRY DIVISION											
Division Committee		9-13 B					9-10* 11-13 14.30-17.30 HH				
Commission II.1: Atomic Weights			9-12 15-18 H	9-12 15-18 H	9-12* EE 14-17 H	9-12 15-18 H					
Commission II.3: High Temperatures and Refractory Materials			9-12 14-17 Z	9-12 14-17 Z	9-12 Z	9-12 Z					

Meeting of	August	Friday 12	Saturday 13	Sunday 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19	Saturday 20	Sunday 21
Commission II.2 (Chairman only) and Commission I.6						10-11* HH					
Division Committee and Commissions' Chairmen							9-10 HH				
Commissions II.1, I.1 and Officers only of V.3 and Committee on Teaching of Chemistry					9-12* EE						
ORGANIC CHEMISTRY DIVISION											
Division Committee		9-12.30 14-17.30* DD					9-12 14-17.30 DD				
Commission III.2 Physical Organic Chemistry			9-12.30 D	9-12 EE							
Commission III.3: Photochemistry			14-17 D	14-17 B	14-17 S						
Commission III.4: Medicinal Chemistry					9-12.30 14-17.30 E	9-12.30 14-17.30 E					
Division Committee and Commissions' Chairmen		14-17.30 DD									
Division Open Meeting				14-17 A							
MACROMOLECULAR DIVISION											
Division Committee		9-12.30 14-17.30 A					9-12 A				
Commission IV.1: Macromolecular Nomenclature			9-12 14-17 GG	9-12 14-17 GG	9-11* HH 11-12.30 14-18.30 GG	9-12 14-17 GG					
Commission IV.2 Polymer Characterization and Properties				9-12 14-17 AA							

Meeting of	August	Friday	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
		12	13	14	15	16	17	18	19	20	21
Commissions IV.1 and I.6					9-11* HH						
ANALYTICAL CHEMISTRY DIVISION											
Division Committee		9-12 14-17 16-19* O	9-10* 10-12 OC				9-12* 14-16* 16-18 E				
Commission V.1: Analytical Reactions and Reagents			14-17 S	9-10* A 11-13 S	9-12 S						
Commission V.2: Microchemical Techniques and Trace Analysis				9-12 14-17 X	9-12 14-17 X	14-17 X					
Commission V.3: Analytical Nomenclature			14-17 BB	9-12 14-17 BB	9-12* KK 17.30-19.30* L	10.30-12* C 16-18* C					
Commission V.4: Spectrochemical and Other Optical Procedures for Analysis			10-13 15-18 KK	9-12 14-17 KK	9-12 15-17 KK	10.30-12* C 14-17 C KK 17.30-18.30* N					
Commission V.5: Electroanalytical Chemistry			10-13 14.30-17.30 L	9-12 14-17 L	9-12 14-17* 17.30-19.30* L	14-17* L					
Commission V.6: Equilibrium Data			10-13 14-17* O	9-12 14-17 O	9-12 14-17 O	9-12* Y 14-17* L					
Subcommittee on Solubility Data		9-13 14.30-17.30 Z	10-13 Y 14-17* O	9-13 14.30-17.30 E	9-12 H 14-18 N	9-12* Y					
Commission V.7: Analytical Radiochemistry and Nuclear Materials			10-13 W	9-12 W	9-12 14-17 W						

Meeting of	August	Friday 12	Saturday 13	Sunday 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19	Saturday 20	Sunday 21
Division Committee Secretary and Commissions' Secretaries			9-10* CC				9-12* 14-16* E				
Division Committee and Commissions' Chairman											
Division Committee, Applied Chemistry Division Committee and Section on Clinical Chemistry		18-19* O									
Division Open Meeting						9-10.30 A					
Commissions V.1, VI.1 and VI.2				9-10* A							
Commission V.3 (Officers only) Committee on Teaching of Chemistry (Officers only), Commissions I.1 and II.1					9-12* EE						
Commission V.3 and Commission on Automation in Clinical Chemistry						16-18* C					
Commissions V.3 and V.4						10.30-12* C					
Commissions V.3 and V.5					17.30-19.30* L						
Commission V.4 and Commission on Quantities and Units in Clinical Chemistry						17.30-18.30* N					
Commissions V.5 and I.3					14-17* L						
Commissions V.5 and V.6						14-17* L					
Commission V.6 and Subcommittee on Solubility Data			14-17* O			9-12* Y					
APPLIED CHEMISTRY DIVISION											
Division Committee		10-12.30 15-18* 18-19* O				14-15 15-16.30* 16.30-18* EE	10-12 14-17 B				

Meeting of	August	Friday 12	Saturday 13	Sunday 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19	Saturday 20	Sunday 21
Commission VI.1: Food Additives			9-10* R 10-12.30 14.30-18 M	9-10* A 10-13 15-18 M	9-12 M 14-16* K	9-13* R 14-15* K 16.30-18.30* U					
Commission VI.2: Food Contaminants			9-10* R 10-13 15-18 MM	9-10* A 10-13 MM	9-12 MM 14-16* K	9-13* R 14-15* K 16.30-18.30* U					
Coordinating Committee on Food Chemistry					17-18 MM						
Commission VI.3: Fermentation			9-12 14-17 P	18-20 P		9-12 P 14-15* K					
Commission VI.4: Oils and Fats			9-12.30 14.30-18 K	9-12.30 14.30-18 K	14-16* 16-18* K	9-12.30 K					
Commission VI.5: Air Quality			9-12 14-17 T	9-12 14-17 T	10.30-12.30* C						
Commission VI.6: Terminal Pesticide Residues			14.30-18.30 R	9-13 R	9-13* A 14.30-18 U	14.30-16 16.30-18.30* U					
Commission VI.7: Pesticide Residue Analysis			14.30-18.30 M	14.30-18.30 R	9-13* A 16-18* K	9-13 16.30-18.30* U					
Coordinating Committee on Pesticide Chemistry			9-13 S				8.30-10 EE				
Commission VI.8: Water Quality			9-12 14-17 LL	9-12 14-17 LL							

Meeting of	August	Friday 12	Saturday 13	Sunday 14	Monday 15	Tuesday 16	Wednesday 17	Thursday 18	Friday 19	Saturday 20	Sunday 21
Commission VI.9; Reclamation of Solid Wastes				9-12 14-16 JJ	9-12 14-16 JJ		9-12 14-18 JJ				
Division Committee and Commissions' Officers		15-18* O				16,30-18* EE					
Division Committee, Analytical Chemistry Division Committee and Clinical Chemistry Section Committee		18-19* O									
Division Open Meeting						15-16,30* EE					
Commissions VI.1 and VI.2			9-10* R			9-13* R					
Commissions VI.1, VI.2 and VI.3						14-15* K					
Commissions VI.1, VI.2 and VI.4					14-16* K						
Commissions VI.1, VI.2, VI.6 and VI.7						16,30-18,30* U					
Commissions VI.1, VI.2 and V.1				9-10* A							
Commissions VI.4, VI.6 and VI.7					16-18* K						
Commission VI.5 and Commission on Toxicology in Clinical Chemistry					10,30-12,30* C						
Commissions VI.6 and VI.7					9-13* A						

CHEMRAWN—CHEMICAL RESEARCH APPLIED TO WORLD NEEDS

The International Union of Pure and Applied Chemistry (IUPAC) is an international scientific organization that has played a major role in the organization, systematization, development and advancement of chemistry and chemical technology. IUPAC, consisting of 43 member nations, is the largest and one of the most important of the international scientific bodies. The member countries are represented by national adhering organizations such as national academies of science, research councils, or other prestigious scientific bodies.

In addition, there are more than 160 industrial companies, located in 17 countries, which form the industrial company associate group. The company associates provide valuable income, although the national adhering organizations are the major sources of funding. Perhaps more important, the corporate associates play an increasingly important role in the more applied aspects of the IUPAC charter responsibilities.

IUPAC is governed by a council of delegates who are appointed by their respective national organizations. The council convenes every two years to conduct the major organizational and policy aspects of the organization.

From its inception in 1919, IUPAC has been concerned with chemical matters of international importance. It has sought to promote co-operation and advancement of chemistry in all of its aspects among the member countries. Presently over 1500 experts cover the entire spectrum of chemical and chemical-related sciences and technologies, and work within six major divisions and some 40 commissions and sections. These bodies are internationally accepted authorities in their field. They are largely responsible for the regulation, standardization, and codification of atomic weights, chemical nomenclature and symbolism, analytical procedures and standard methods of assay, etc. Through its many faceted conferences and symposia IUPAC has also served as an important non-political international forum for scientists around the world in virtually every aspect of chemistry and chemical technology.

Thus IUPAC has played an important part in international science over the past 58 years. But the world of 1977 is vastly different from

the one of 1919 and the decades just after. Problems then thought to be of interest only to chemists now command the interest of entire societies. In view of these changes, IUPAC is expected to play an increasingly important role in applying chemistry and chemical technology to the worldwide needs of man.

In 1973, the IUPAC Conference in Munich included on its agenda an item entitled 'Opportunities for International Cooperation through IUPAC'. One suggestion was that there be a new mechanism in IUPAC whereby council members could aid in identifying and solving important problems of chemistry having direct impact on world needs. The general idea was unanimously approved by the 43 nations involved, and the statement was adopted under the heading 'Chemical Research Applied to World Needs'. Like so many other long titles, this one is already being called by its acronym—CHEMRAWN.

It is not the objective of IUPAC or of CHEMRAWN to undertake research on its own. Rather, the CHEMRAWN statement was designed to reflect a set of purposes around which a variety of activities might be organized.

The first CHEMRAWN purpose embodies the first step of science: to identify human needs amenable to satisfaction through chemistry with particular attention to needs of global or multinational dimension.

A second CHEMRAWN purpose is to provide a non-political international forum for the gathering, discussion, advancement, and dissemination of chemical knowledge deemed useful for the improvement of man and his environment.

And the third purpose is to provide an international, non-governmental source of information for the benefit of research institutions, national governments, and international agencies with respect to chemistry and world needs.

IUPAC's initial enterprise under CHEMRAWN is to convene the first 'World Conference on Future Sources of Organic Raw Materials'. This international conference will treat alternatives to petroleum as future sources of chemicals and chemical feedstocks. It is expected that other conferences will follow dealing with metal and other mineral resources. These technologies not only deal with the future life blood of some of our major industries, but will also stimulate vast and fertile new fields for those working in the more basic and exploratory areas. It is hard to imagine a subject of higher global importance or of greater interest to the industrial and academic scientist.

The 'World Conference on Future Sources of Organic Raw Materials' will be held in Toronto on 10 - 13 July 1978 and the Conference is jointly sponsored by IUPAC, The Chemical Institute of Canada, and the American Chemical Society with a large number of other supporting organizations. In this Conference, world leaders from governments, industries and academia will attempt to define and set in perspective those factors that will ultimately determine the source of organic raw materials necessary to support world chemical industries at the end of the century. The goal and focal point of the entire Conference will be an attempt by recognized and influential leaders to take an initial step towards developing a sense for future direction that may be of value to the world chemical community. Recommendations will be set forth in the Conference proceedings and will be distributed to participants and policy makers in governments, industries, and academic institutions.

One of the most satisfying aspects of the 'World Conference on Future Sources of Organic Raw Materials' has been the unbridled enthusiasm for the subject and the willingness of influential leaders from around the world to actively participate. We think you will agree that this kind of conference represents a bold new initiative for our profession and industry. The purpose of CHEMRAWN and the resources of IUPAC are obviously limited. We cannot do everything about every thing, but we can do something about some things; and this IUPAC is attempting to do. To succeed we will need your encouragement and help.

BRYANT W. ROSSITER
Chairman
CHEMRAWN Planning Committee

IUPAC RECOMMENDATIONS ON SYMBOLS, UNITS, NOMENCLATURE, AND CONVENTIONS

COMPLETE LIST OF CURRENT RECOMMENDATIONS (as at the end of 1976)

A major activity of the International Union of Pure and Applied Chemistry (IUPAC) is to produce Recommendations on Symbols, Units, Nomenclature, and Conventions. To cover the main branches of chemistry IUPAC has 6 Commissions whose sole function is to prepare such recommendations. These Commissions are on: (i) Physicochemical Symbols, Terminology, and Units; (ii) Nomenclature of Inorganic Chemistry; (iii) Nomenclature of Organic Chemistry; (iv) Macromolecular Nomenclature; (v) Nomenclature of Analytical Chemistry; (vi) Quantities and Units in Clinical Chemistry.

In addition, IUPAC has a joint Commission with IUB (International Union of Biochemistry) on Biochemical Nomenclature. There are other Commissions within IUPAC whose main activity is not in the preparation of nomenclature recommendations but in their own special branch of chemistry they put forward nomenclature recommendations as well as conventions. In order to coordinate the activities of all Commissions producing nomenclature recommendations IUPAC has an Interdivisional Committee on Nomenclature and Symbols. Members from all Nomenclature Commissions are represented on this Committee. This ensures that a uniform and consistent Nomenclature is evolved throughout the spectrum of chemical science. It is also necessary for IUPAC to collaborate with organizations representing other branches of science. To achieve this IUPAC has reciprocal arrangements with other international scientific bodies to appoint observers/ representatives in its Commissions as well as on the Interdivisional Committee. In particular, mention may be made of organizations such as: (i) Bureau International des Poids et Mesures; (ii) Commission on Symbols, Units and Nomenclature (SUN) of the International Union of Pure and Applied Physics; (iii) International Union of Biochemistry; (iv) International Organization for Standardization.

During the last 15 years or so IUPAC has published a large number of nomenclature recommendations: 3 major books and several

nomenclature reports in specific areas of chemistry. IUPAC publishes its recommendations on nomenclature and symbols in two stages—provisional and final (definitive). The provisional recommendations used to be published in the IUPAC *Information Bulletin*. Since 1969 they have been published as Provisional Nomenclature Appendices (yellow booklets) to the Bulletin. These Appendices are supplied free-of-charge to the international chemical community with a view to inviting comments. After the comments have been taken into consideration provisional versions are revised and published as definitive nomenclature recommendations normally in IUPAC's official journal *Pure and Applied Chemistry*.

Given hereunder is a compilation of the current IUPAC Nomenclature Recommendations and Conventions published since 1960. The reference given in this list is to the latest version of a nomenclature recommendation. In some cases where definitive versions have not so far been published reference is given to the publication in the provisional/tentative form. The compilation has been classified into various sections according to the subject.

I. Physical Chemistry

1. *Manual of Symbols and Terminology for Physicochemical Quantities and Units, 1973 Edition* (Prepared by Commission on Physicochemical Symbols, Terminology, and Units). Published in 1975 by Butterworths (London) but now available from Pergamon Press, Oxford. This publication popularly known as the 'Green Book' includes as Appendix I *Definitions of Activities and Related Quantities*.
2. *Definitions, Terminology and Symbols in Colloid and Surface Chemistry—I* (being Appendix II to the *Manual*) (Prepared by Commission on Colloid and Surface Chemistry). Published in *Pure Appl. Chem.*, Vol. 31, No. 4 (1972), pp. 577 - 638.
3. *Definitions, Terminology and Symbols in Colloid and Surface Chemistry—II. Heterogeneous Catalysis* [being Appendix II (Part II) to the *Manual*] (Prepared by Commission on Colloid and Surface Chemistry). Published in *Pure Appl. Chem.*, Vol. 46, No. 1 (1976), pp. 71 - 90.

Note: The name of the Commission given is as it existed at the time the recommendation was prepared. An up-to-date list of all Commissions/Committees with the names and full addresses of Members has been published in *Comptes Rendus 28th Conference (Madrid, 1975): Part A—Membership Lists* (available from Pergamon Press Ltd., Headington Hill Hall, Oxford OX3 0BW, UK).

4. *Electrochemical Nomenclature* (being Appendix III to the *Manual*) (Prepared by Commission on Electrochemistry). Published in *Pure Appl. Chem.*, Vol. 37, No. 4 (1974), pp. 499 - 516.
5. *Resolution on Publication of Calorimetric and Thermodynamic Data* (Prepared by Commission on Chemical Thermodynamics). Published in *Pure Appl. Chem.*, Vol. 2, Nos. 1 - 2 (1961), pp. 339 - 342.
6. *A Guide to Procedures for the Publication of Thermodynamic Data* (Prepared by Commission on Thermodynamics and Thermochemistry). Published in *Pure Appl. Chem.*, Vol. 29, Nos. 1 - 3 (1972), pp. 395 - 408.
7. *Recommendations for the Presentation of NMR Data for Publication in Chemical Journals—A. Conventions Relating to Proton Spectra* (Prepared by Commission on Molecular Structure and Spectroscopy). Published in *Pure Appl. Chem.*, Vol. 29, No. 4 (1972), pp. 625 - 628.
8. *Recommendations for the Presentation of NMR Data for Publication in Chemical Journals—B. Conventions Relating to Spectra from Nuclei Other than Protons* (Prepared by Commission on Molecular Structure and Spectroscopy). Published in *Pure Appl. Chem.*, Vol. 45, Nos. 3 - 4 (1976), pp. 217 - 219.
9. *Recommendations for the Presentation of Raman Spectra for Cataloging and Documentation in Permanent Data Collections* (Prepared by Commission on Molecular Structure and Spectroscopy). Published in *Pure Appl. Chem.*, Vol. 36, Nos. 1 - 2 (1973), pp. 275 - 278.
10. *Nomenclature and Conventions for Reporting Mössbauer Spectroscopic Data* (Prepared jointly by Commission on Physicochemical Symbols, Terminology and Units and Commission on Molecular Structure and Spectroscopy). Published in *Pure Appl. Chem.*, Vol. 45, Nos. 3 - 4 (1976), pp. 211 - 216.
11. *Nomenclature and Spectral Presentation in Electron Spectroscopy Resulting from Excitation by Photons* (Prepared by Commission on Molecular Structure and Spectroscopy). Published in *Pure Appl. Chem.*, Vol. 45, Nos. 3 - 4 (1976), pp. 221 - 224.
12. *Recommendations for the Presentation of Infrared Absorption Spectra in Data Collections* (Prepared by Commission on Molecular

Structure and Spectroscopy). Published as *Provisional Nomenclature Appendix No. 50* (September 1976) to *IUPAC Information Bulletin*.

13. *Symbolism and Nomenclature for Mass Spectroscopy* (Prepared by Commission on Molecular Structure and Spectroscopy). Published as *Provisional Nomenclature Appendix No. 51* (September 1976) to *IUPAC Information Bulletin*.

14. *Definition and Symbolism of Molecular Force Constants* (Prepared by Commission on Molecular Structure and Spectroscopy). Published as *Provisional Nomenclature Appendix No. 56* (December 1976) to *IUPAC Information Bulletin*.

15. *Chemical Nomenclature, and Formulation of Compositions, of Synthetic and Natural Zeolites* (Prepared jointly by Commission on Colloid and Surface Chemistry and Commission on Nomenclature of Inorganic Chemistry in collaboration with International Mineralogical Association). Published as *Provisional Nomenclature Appendix No. 41* (January 1975) to *IUPAC Information Bulletin*.

16. *Recommended Names and Symbols for Light and Related Electromagnetic Radiation* (Prepared by Commission on Physicochemical Symbols, Terminology and Units). Published in the 1973 Edition of *Manual of Symbols and Terminology for Physicochemical Quantities and Units* (Butterworths, London: 1975), pp. 10 - 11.

17. *Expression of Results in Quantum Chemistry* (Prepared by Commission on Physicochemical Symbols, Terminology and Units). Published as *Provisional Nomenclature Appendix No. 49* (September 1976) to *IUPAC Information Bulletin*.

18. *Reporting Experimental Data Dealing with Critical Micellization Concentrations (c.m.c.'s)* (Prepared by Commission on Colloid and Surface Chemistry). Published as *Provisional Nomenclature Appendix No. 52* (September 1976) to *IUPAC Information Bulletin*.

19. *Selected Definitions, Terminology, and Symbols for Rheological Properties* (Prepared by Commission on Colloid and Surface Chemistry). Published as *Provisional Nomenclature Appendix No. 57* (December 1976) to *IUPAC Information Bulletin*.

II. Inorganic Chemistry

1. *Nomenclature of Inorganic Chemistry* (2nd Ed.: 1970 Rules) (Prepared by Commission on Nomenclature of Inorganic Chemistry). Published in *Pure Appl. Chem.*, Vol. 28, No. 1 (1971), pp. 1 - 110.

Also published as a book popularly known as the 'Red Book' by Butterworths, London (1971) but now available from Pergamon Press, Oxford.

2. *Nomenclature of Inorganic Boron Compounds* (Prepared by Commission on Nomenclature of Inorganic Chemistry). Published in *Pure Appl. Chem.*, Vol. 30, Nos. 3 - 4 (1972), pp. 681 - 710.

3. *Nomenclature of Organic Chemistry: Section D (Tentative Rules)*—Organic Compounds Containing Elements which are not exclusively Carbon, Hydrogen, Oxygen, Nitrogen, Halogen, Sulfur, Selenium and Tellurium (Prepared jointly by Commission on Nomenclature of Inorganic Chemistry and Commission on Nomenclature of Organic Chemistry). Published as *Tentative Nomenclature Appendix No. 31* (August 1973) to *IUPAC Information Bulletin*.

4. *Chemical Nomenclature, and Formulation of Compositions, of Synthetic and Natural Zeolites* (Prepared jointly by Commission on Nomenclature of Inorganic Chemistry and Commission on Colloid and Surface Chemistry in collaboration with International Mineralogical Association). Published as *Provisional Nomenclature Appendix No. 41* (January 1975) to *IUPAC Information Bulletin*.

5. *Recommendations for the Naming of Elements of Atomic Numbers Greater than 105* (Prepared by Commission on Nomenclature of Inorganic Chemistry). Published as *Provisional Nomenclature Appendix No. 55* (December 1976) to *IUPAC Information Bulletin*.

III. Organic Chemistry and Biochemistry

1. *Nomenclature of Organic Chemistry: Sections A, B & C (Definitive Rules), 3rd Ed.*—Section A: Hydrocarbons; Section B: Fundamental Heterocyclic Systems; Section C: Characteristic Groups containing Carbon, Hydrogen, Oxygen, Nitrogen, Halogen, Sulfur, Selenium, and/or Tellurium (Prepared by Commission on Nomenclature of Organic Chemistry). Published in 1971 by Butterworths (London) but now available from Pergamon Press, Oxford. The publication is popularly known as the 'Blue Book'.

2. *Nomenclature of Organic Chemistry: Section D (Tentative Rules)*—Organic Compounds Containing Elements which are not exclusively Carbon, Hydrogen, Oxygen, Nitrogen, Halogen, Sulfur, Selenium and Tellurium (Prepared jointly by Commission on Nomenclature of Organic Chemistry and Commission on Nomenclature of

- Inorganic Chemistry). Published as *Tentative Nomenclature Appendix No. 31* (August 1973) to *IUPAC Information Bulletin*.
3. *Nomenclature of Organic Chemistry: Section E - Stereochemistry (Recommendations 1974)* (Prepared by Commission on Nomenclature of Organic Chemistry). Published in *Pure Appl. Chem.*, Vol. 45, No. 1 (1976), pp. 11 - 30.
4. *Nomenclature of Organic Chemistry: Section F - Natural Products and Related Compounds* (Prepared by Commission on Nomenclature of Organic Chemistry). Published as *Provisional Nomenclature Appendix No. 53* (December 1976) to *IUPAC Information Bulletin*.
5. *Carbohydrate Nomenclature—1 (Tentative Rules)* (Prepared jointly by Commission on Nomenclature of Organic Chemistry and IUPAC - IUB Commission on Biochemical Nomenclature). Published as *Tentative Nomenclature Appendix No. 7* (September 1970) to *IUPAC Information Bulletin*.
6. *Nomenclature of Carotenoids (Rules 1974)* (Prepared jointly by Commission on Nomenclature of Organic Chemistry and IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 41, No. 3 (1975), pp. 405 - 431.
7. *Nomenclature of Steroids (Rules 1971)* (Prepared jointly by Commission on Nomenclature of Organic Chemistry and IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 31, Nos. 1 - 2 (1972), pp. 283 - 322.
8. *Nomenclature of Cyclitols (Recommendations 1973)* (Prepared jointly by Commission on Nomenclature of Organic Chemistry and IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 37, Nos. 1 - 2 (1974), pp. 283 - 297.
9. *Nomenclature of α -Amino Acids* (Prepared jointly by Commission on Nomenclature of Organic Chemistry and IUPAC - IUB Commission on Biochemical Nomenclature). Published as *Provisional Nomenclature Appendix No. 46* (September 1975) to *IUPAC Information Bulletin*.
10. *Symbols for Amino Acid Derivatives and Peptides (Rules 1974)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 40, No. 3 (1974), pp. 315 - 331.

11. *A One-letter Notation for Amino Acid Sequences (Rules 1971)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 31, No. 4 (1972), pp. 639 - 645.
12. *Rules for Naming Synthetic Modifications of Natural Peptides (Rules 1971)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 31, No. 4 (1972), pp. 647 - 653.
13. *Abbreviated Nomenclature of Synthetic Polypeptides (Polymerized Amino Acids) (Rules 1971)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 33, Nos. 2 - 3 (1973), pp. 437 - 444.
14. *Abbreviations and Symbols for the Description of Conformation of Polypeptide Chains (Rules 1974)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 40, No. 3 (1974), pp. 291 - 308.
15. *Nomenclature of Peptide Hormones* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published as *Provisional Nomenclature Appendix No. 48* (September 1975) to *IUPAC Information Bulletin*.
16. *Nomenclature of Iron-Sulfur Proteins (Recommendations 1973)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published as *Tentative Nomenclature Appendix No. 32* (August 1973) to *IUPAC Information Bulletin*.
17. *Nomenclature of Quinones with Isoprenoid Side-Chains (Rules 1973)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 38, No. 3 (1974), pp. 439 - 447.
18. *Nomenclature for Vitamin B-6 and Related Compounds (Rules 1972)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 33, Nos. 2 - 3 (1973), pp. 445 - 452.
19. *Nomenclature of Tocopherols and Related Compounds* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published as *Provisional Nomenclature Appendix No. 47* (September 1975) to *IUPAC Information Bulletin*.
20. *Abbreviations and Symbols for Nucleic Acids, Polynucleotides and their Constituents (Rules 1974)* (Prepared by IUPAC - IUB Com-

mission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 40, No. 3 (1974), pp. 277 - 290.

21. *Nomenclature of Corrinoids* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 48, No. 4 (1976), pp. 495 - 502.

22. *Nomenclature of Multiple Forms of Enzymes (Rules 1974)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 40, No. 3 (1974), pp. 309 - 314.

23. *Enzyme Nomenclature (Recommendations 1972)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published as a book (443 pages; casebound and soft-cover editions) by Elsevier, PO Box 1270, Amsterdam, The Netherlands.

24. *Nomenclature of Lipids (Tentative)* (Prepared by IUPAC - IUB Commission on Biochemical Nomenclature). Published in *IUPAC Information Bulletin*, No. 30 (October 1967), pp. 18 - 26.

IV. Macromolecular Chemistry

1. *Report on Nomenclature Dealing with Steric Regularity in High Polymers* (Prepared by Commission on Macromolecules). Published in *Pure Appl. Chem.*, Vol. 12, Nos. 1 - 4 (1966), pp. 643 - 656.

2. *Recommendations for Abbreviations of Terms Relating to Plastics and Elastomers* (Prepared by Section on Plastics and High Polymers). Published in *Pure Appl. Chem.*, Vol. 18, No. 4 (1969), pp. 581-589.

3. *List of Standard Abbreviations (Symbols) for Synthetic Polymers and Polymer Materials (Rules 1974)* (Prepared by Commission on Macromolecular Nomenclature). Published in *Pure Appl. Chem.*, Vol. 40, No. 3 (1974), pp. 473 - 476.

4. *Basic Definitions of Terms Relating to Polymers (Rules 1974)* (Prepared by Commission on Macromolecular Nomenclature). Published in *Pure Appl. Chem.*, Vol. 40, No. 3 (1974), pp. 477 - 491.

5. *Nomenclature of Single-strand Organic Polymers* (Prepared by Commission on Macromolecular Nomenclature). Published in *Pure Appl. Chem.*, Vol. 48, No. 3 (1976), pp. 373 - 385.

V. Analytical Chemistry

1. *Report on the Standardization of pH and Related Terminology* (Prepared jointly by Commission on Electrochemical Data and Com-

mission on Physicochemical Symbols and Terminology). Published in *Pure Appl. Chem.*, Vol. 1, No. 1 (1960), pp. 163 - 168 (see also publication 1 listed under section I. Physical Chemistry).

2. *Terminology for Scales of Working in Microchemical Analysis* (Prepared by Commission on Microchemical Techniques). Published in *Pure Appl. Chem.*, Vol. 1, No. 1 (1960), pp. 169 - 170.

3. *Recommendations for Terminology to be used with Precision Balances* (Prepared by Commission on Microchemical Techniques). Published in *Pure Appl. Chem.*, Vol. 1, No. 1 (1960), pp. 171 - 175.

4. *Preliminary Recommendations on Nomenclature and Presentation of Data in Gas Chromatography* (Prepared by Section on Analytical Chemistry). Published in *Pure Appl. Chem.*, Vol. 1, No. 1 (1960), pp. 177 - 186.

5. *Recommended Nomenclature for Titrimetric Analysis* (Prepared by Commission on Analytical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 18, No. 3 (1969), pp. 427 - 436.

6. *Recommendations for the Presentation of Results of Chemical Analysis* (Prepared by Commission on Analytical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 18, No. 3 (1969), pp. 437 - 442.

7. *Recommended Symbols for Solution Equilibria* (Prepared by Commission on Equilibrium Data). Published in *Pure Appl. Chem.*, Vol. 18, No. 3 (1969), pp. 457 - 464.

8. *Recommended Nomenclature for Liquid-Liquid Distribution* (Prepared by Commission on Analytical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 21, No. 1 (1970), pp. 109 - 114.

9. *Recommended Nomenclature for Automatic Analysis* (Prepared by Commission on Analytical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 21, No. 4 (1970), pp. 527 - 531.

10. *Recommendations on Ion Exchange Nomenclature* (Prepared by Commission on Analytical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 29, No. 4 (1972), pp. 617 - 624.

11. *Nomenclature, Symbols, Units and Their Usage in Spectrochemical Analysis - I. General Atomic Emission Spectroscopy* (Prepared by Commission on Spectrochemical and Other Optical Procedures for Analysis). Published in *Pure Appl. Chem.*, Vol. 30, Nos. 3 - 4 (1972), pp. 651 - 679.

12. *Nomenclature, Symbols, Units and Their Usage in Spectrochemical Analysis—II. Data Interpretation (Rules 1975)* (Prepared by Com-

mission on Spectrochemical and Other Optical Procedures for Analysis). Published in *Pure Appl. Chem.*, Vol. 45, No. 2 (1976), pp. 99 - 103.

13. *Nomenclature, Symbols, Units and Their Usage in Spectrochemical Analysis—III. Analytical Flame Spectroscopy and Associated Non-Flame Procedures (Rules 1975)* (Prepared by Commission on Spectrochemical and Other Optical Procedures for Analysis). Published in *Pure Appl. Chem.*, Vol. 45, No. 2 (1976), pp. 105 - 123.

14. *Nomenclature, Symbols, Units and Their Usage in Spectrochemical Analysis—IV. X-Ray Emission Spectroscopy* (Prepared by Commission on Spectrochemical and Other Optical Procedures for Analysis). Published as *Provisional Nomenclature Appendix No. 54* (December 1976) to *IUPAC Information Bulletin*.

15. *Recommendations for Nomenclature of Thermal Analysis (Rules 1973)* (Prepared by Commission on Analytical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 37, No. 4 (1974), pp. 439 - 444.

16. *Recommendations on Nomenclature for Chromatography (Rules 1973)* (Prepared by Commission on Analytical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 37, No. 4 (1974), pp. 445 - 462.

17. *Recommendations on Nomenclature for Contamination Phenomena in Precipitation from Aqueous Solutions (Rules 1973)* (Prepared by Commission on Analytical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 37, No. 4 (1974), pp. 463 - 468.

18. *Recommendations for Nomenclature of Mass Spectrometry (Rules 1973)* (Prepared by Commission on Analytical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 37, No. 4 (1974), pp. 469 - 480.

19. *Classification and Nomenclature of Electroanalytical Techniques (Rules 1975)* (Prepared by Commission on Electroanalytical Chemistry). Published in *Pure Appl. Chem.*, Vol. 45, No. 2 (1976), pp. 81 - 97.

20. *Recommendations for Sign Conventions and Plotting of Electrochemical Data (Rules 1975)* (Prepared by Commission on Electroanalytical Chemistry). Published in *Pure Appl. Chem.*, Vol. 45, No. 2 (1976), pp. 131 - 134.

21. *Recommendations for Nomenclature of Ion-Selective Electrodes (Rules 1975)* (Prepared by Commission on Analytical Nomenclature). Published in *Pure Appl. Chem.*, Vol. 48, No. 1 (1976), pp. 127 - 132.

22. *Proposed Terminology and Symbol for the Transfer of Solutes from One Solvent to Another* (Prepared by Commission on Electro-analytical Chemistry). Published as *Provisional Nomenclature Appendix*, No. 34 (August 1974) to *IUPAC Information Bulletin*.
23. *Recommendations on Usage of Terms 'Equivalent' and 'Normal'* (Prepared by Commission on Analytical Nomenclature). Published as *Provisional Nomenclature Appendix*, No. 36 (August 1974) to *IUPAC Information Bulletin*.
24. *Recommendations for Publication of Papers on Molecular Absorption Spectrophotometry in Solution between 200 and 800 nm* (Prepared by Commission on Analytical Nomenclature). Published as *Provisional Nomenclature Appendix*, No. 44 (January 1975) to *IUPAC Information Bulletin*.
25. *Recommendations on Nomenclature of Scales of Working in Analysis* (Prepared by Commission on Analytical Nomenclature). Published as *Tentative Nomenclature Appendix*, No. 18 (February 1972) to *IUPAC Information Bulletin*.
26. *Recommendations on Nomenclature for Nuclear Chemistry* (Prepared by Commission on Analytical Radiochemistry and Nuclear Materials). Published as *Tentative Nomenclature Appendix*, No. 25 (June 1972) to *IUPAC Information Bulletin*.
27. *List of Trivial Names and Synonyms (for Substances used in Analytical Chemistry)* (Prepared by Commission on Analytical Nomenclature). Published as *Provisional Nomenclature Appendix*, No. 45 (September 1975) to *IUPAC Information Bulletin*.
28. *Status of Faraday Constant as an Analytical Standard* (Prepared by Commission on Electroanalytical Chemistry). Published in *Pure Appl. Chem.*, Vol. 45, No. 2 (1976), pp. 125 - 130.

VI. Clinical Chemistry

1. *Quantities and Units in Clinical Chemistry (Recommendations 1973)* (Prepared jointly by IUPAC Commission on Quantities and Units of the Clinical Chemistry Section and the IFCC Committee on Standards Expert Panel on Quantities and Units). Published in *Pure Appl. Chem.*, Vol. 37, No. 4 (1974), pp. 517 - 546.
2. *List of Quantities in Clinical Chemistry (Recommendations 1973)* (Prepared jointly by IUPAC Commission on Quantities and Units of

the Clinical Chemistry Section and the IFCC Committee on Standards Expert Panel on Quantities and Units). Published in *Pure Appl. Chem.*, Vol. 37, No. 4 (1974), pp. 547 - 572.

P. D. GUJRAL

REPORTS OF IUPAC BODIES

IUPAC - IUB COMMISSION ON BIOCHEMICAL NOMENCLATURE (CBN)

Dorking, 9 - 12 June 1975

Present: Prof. O. HOFFMANN-OSTENHOF (Chairman), Dr. W. E. COHN (Secretary), Prof. A. E. BRAUNSTEIN, Dr. B. L. HORECKER, Dr. W. B. JAKOBY, Prof. W. KLYNE, Prof. P. KARLSON, Dr. B. KEIL, Prof. C. LIÉBECQ, Prof. E. C. WEBB. Dr. K. L. LOENING participated as an Observer from the IUPAC Commissions on Macromolecular Nomenclature (CMN) and Nomenclature of Organic Chemistry (CNOC), Dr. R. DYBKAER as an Observer from the IUPAC Commission on Quantities and Units in Clinical Chemistry (CQUCC), and Prof. E. C. SLATER as an Observer from the IUB Commission of Editors of Biochemical Journals (CEBJ).

1. Minutes of Previous Meeting

The Minutes of the meeting held at Santiago de Compostela on 3 - 6 May 1974 [see *Information Bulletin* No. 49 (March 1975), pp. 24 - 29] were approved.

2. Chairman's Report

HOFFMANN-OSTENHOF, noting that CBN had now completed its eleventh year (the tenth under his Chairmanship), summarized the chief accomplishments of CBN since its formation in 1964 as a joint Commission of IUPAC and IUB. Twenty-one sets of Recommendations had been published, some in various subsequently slightly revised versions, by IUPAC and in several journals of wide circulation affiliated with CEBJ, and many in translations into French, German, Russian, and Czech. With the cooperation of the journals and the US National Research Council, through its Office of Biochemical Nomenclature, reprints of all these publications (excepting only *Enzyme Nomenclature Recommendation 1972*) had been sent free of charge to individual requestors; the gross number so distributed was well over 10,000. In these publications, CBN had codified and systematized the nomenclature (trivial names, abbreviations and symbols) of most of the major fields of biochemistry. Its major work had been *Enzyme*

Nomenclature 1972; over 7,000 copies had been sold by the publisher, Elsevier Scientific Publishing Co. In the past year, CBN documents dealing with revisions of the nomenclature of quinones, tocopherols, and cyclitols had appeared, as well as two new works covering α -amino acids (joint with CNOC) and peptide hormones. Work was in progress on the nomenclature of phosphorus-containing compounds of biochemical importance, of carbohydrates (revision of the major opus constructed earlier with CNOC), of tetrapyrroles (joint with CNOC), of lipids (a revision of the earlier proposals, expanded to include glycolipids), and on other subjects (see below). *Enzyme Nomenclature Recommendations* 1972 was being expanded on a continuing basis; the first supplement was nearing completion.

3. Previously Published Documents under Reconsideration

(i) Several sections of 'Miscellaneous Compounds' (1966), which included many substances that were vitamins and coenzymes, had been revised in recent years (B-6, Corrinoids, Quinones, Tocopherols), partly also in order to eliminate differences with IUNS documents on these subjects. Those remaining (folic acids, vitamin K, vitamin D, and certain aspects of tocopherols) would be discussed with IUNS with a view to resolving differences. It was proposed to add a section on pteridines to the Folic Acid revision, and a section on Flavins (see below).

(ii) 'Carbohydrate Nomenclature-1' [Tentative Nomenclature Appendix No. 7 (September 1970) to the *Information Bulletin*], a joint document of CNOC and CBN, was being reconsidered by a subcommittee, now led by H. PAULSEN (succeeding W. WHELAN); with particular emphasis on resolving the question of contiguous vs. non-contiguous nomenclature. This subcommittee had also taken over work on other carbohydrate nomenclature documents (Monosaccharide Conformations, Unsaturated Carbohydrates, Branched-chain Carbohydrates). Preliminary drafts of these three had been circulated to CNOC and CBN and were regarded as generally satisfactory. With respect to a fourth area, Polysaccharide Nomenclature, CBN expressed its preference for the "poly" system, with the "glycan" system as a less-preferred alternative.

(iii) 'Lipids' (1967) had been revised and extended and a new section on glycolipids had been added. The CNOC-CBN subcommittee (KARLSON, Chairman) submitted its draft to CBN for discussion

and for the resolution of certain questions. After incorporation of the decisions reached at the meeting, the document would be circulated in the usual fashion to CBN, CEBJ, and CNOC.

(iv) 'Enzyme Units' (1972), and a redraft by LIÉBECQ, was again discussed. A new draft was to be prepared by H. B. F. DIXON in line with the discussion.

(v) 'Nomenclature of Iron-Sulfur Proteins' [Tentative Nomenclature Appendix No. 32 (August 1973) to the *Information Bulletin*] being revised under the leadership of H. BEINERT. At the meeting SLATER outlined the complexities in this area (number of Fe's and S's per center; naming prosthetic groups; details of representation in symbols). He would convey CBN opinions on these to the chairman of the subcommittee.

4. Other Documents in Preparation

(i) 'Phosphorus Compounds of Biological Importance' ('Biochemical P-Rules'), drafted by COHN, was discussed at length, and all major questions still outstanding were resolved. The revised draft was to be circulated in the usual fashion to CBN, CEBJ, and CNOC.

(ii) 'Conformation of Polysaccharides'. A new draft was expected momentarily from the subcommittee (R. H. MARCHESSAULT, Chairman). KLYNE had indicated CBN's and CNOC's thoughts to the subcommittee Chairman.

(iii) 'Conformation of Polynucleotides'. The 1973 ("Jerusalem") proposal was still being discussed in the subcommittee (F. CRAMER, Chairman). KLYNE outlined the areas in which decisions between alternative systems must be made, and he would convey CBN's opinions to the subcommittee chairman.

(iv) 'Enzymes'. A draft of the first Supplement (Revisions, Corrections, and over 200 additions) to *Enzyme Nomenclature Recommendations* 1972 was presented by WEBB, Chairman of the Revision Committee (all CBN plus others), and all outstanding questions were resolved. Publication would take place within a matter of months. Certain areas (nucleases, proteinases, oxygenases, phenol oxidases, transport ATPases) were in need of further attention; assignments of these to various CBN Members were made.

(v) 'Tetrapyrroles', joint with CNOC, was presented and discussed by the Chairman of the subcommittee, R. BONNETT. With a few minor

additions, this document was accepted and approved by CBN. It could now go to CNOC.

(vi) 'Multiple Forms of Enzymes'. A draft prepared by HORECKER was examined. A revision will be circulated to CBN and CEBJ.

5. Subjects under Discussion

(i) 'Cytochromes' was still under discussion in the subcommittee (M. KAMEN, Chairman).

(ii) 'Flavins' needed a Convenor.

(iii) 'Catecholamines' had a Convenor (W. LOVENBERG) and had been retitled 'Biogenic Amines'. All neurogenic amines would be considered.

(iv) 'Carotenoids'. The revision was to include new compounds and a revision of the vitamin A section of Miscellaneous Compounds (see above) would be discussed by KLYNE with experts at a forthcoming meeting.

(v) 'Prostaglandins'. KARLSON would attempt to codify the basic forms.

(vi) 'Proteins'. It was hoped to organize subcommittees to cover various classes of nonenzymic proteins, such as snake-venom toxins, histones (a CIBA Conference had made recommendations here), factors in protein biosynthesis (an *ad hoc* subcommittee, chaired by H. WEISSBACH, had discussed this matter), blood-clotting factors.

(vii) 'Immobilized Enzymes'. No action had taken place. A Gordon Conference proposal had been distributed.

(viii) 'Abbreviations and Symbols' (1965). DILLMAN, LIÉBECQ, and COHN were asked to undertake the revision. Note was taken of a document prepared by the US National Research Council Office of Biochemical Nomenclature listing all CBN-approved terms, but something less extensive was desired.

(ix) 'Lipoproteins'. A working party under the convenorship of H. EDER had been organized.

6. Next Meeting

The 1976 meeting of CBN was planned for 31 May - 3 June in New York.

W. E. COHN

COMMISSION ON NOMENCLATURE OF ORGANIC CHEMISTRY (CNOC)

Santiago de Compostela, 24 - 30 August 1975

Preseni: Prof. N. LOZAC'H (Chairman), Mr. S. P. KLESNEY (Secretary), Dr. L. C. CROSS, Dr. H. GRÜNEWALD, Dr. K. L. LOENING, Prof. J. RIGAUDY (Titular Members); Dr. W. H. POWELL, Prof. S. VEIBEL, Dr. H. J. ZIEGLER (Associate Members); Prof. O. HOFFMANN-OSTENHOF [Observer, IUPAC-IUB Commission on Biochemical Nomenclature (CBN)].

1. Minutes of Previous Meeting

The minutes of the meeting held at Dorking on 13 - 20 July 1974 had been published in *Information Bulletin* No. 49 (March 1975), pp. 31-34.

2. Isotopically Modified Compounds

Some amendments were made to Draft IV (February 1975). The revised document was approved in principle by the Commission on Nomenclature of Inorganic Chemistry (CNIC) and by Prof. HOFFMANN-OSTENHOF for CBN. It would be designated as Section H in *Nomenclature of Organic Chemistry* (the Blue Book). The agreed changes would be incorporated by Prof. RIGAUDY into a new document which, after allowing time for minor comment by the working party (RIGAUDY, BLÁHA, COHN, CROSS, KLESNEY, MINGOS, POWELL) and CNOC, would be submitted for publication as a Provisional Nomenclature Appendix to the *Information Bulletin*.

3. Revision of Sections A, B, C, and D*

The purpose of the revisions and reorganization was to improve the consistency of the rules and to simplify their application and facilitate their availability to chemists and teachers. Guidelines (document of 75.06.11) for the actual revision were discussed. It would be undertaken by Mrs. J. MERRITT at Chemical Abstracts Service under the supervision of the working party (GRÜNEWALD, CROSS, LOENING). Topics such as amino acids, terpenes, steroids, which were covered by other IUPAC rules, would not be treated exhaustively. In revising Section D, CNOC would seek the cooperation and assistance of CNIC.

**Nomenclature of Organic Chemistry*, 1971 (combined Sections A, B, and C); Section D: Tentative Nomenclature Appendix No. 31 to *Information Bulletin*, August 1973.

4. Section E: Fundamental Stereochemistry

The revised version was in course of publication [scheduled *Pure and Applied Chemistry* **45**, 11 (1976)]. The working party (KLYNE, BLÁHA, CROSS, GRÜNEWALD, VEIBEL, WEILL-RAYNAL) now had to consider new areas, such as conformations, α - β convention, and amplification of the use of endo and exo.

5. Nodal Nomenclature and Phanés

Phane nomenclature was now being considered together with nodal nomenclature by a working party (LOZAC'H, BALABAN, ECKROTH, HIRAYAMA, KAUFFMANN, LOENING, VÖGTLE). Draft II (document of 74.11.5) was comprised of (a) assemblies of open chains, (b) ring systems, (c) assemblies of open chains and ring systems. The large potentialities of this new approach had been recognized for various purposes: (a) and (b) had raised no particular objections, and the modular principle used in (c) had been discussed at length. The document would be completed by Prof. LOZAC'H and circulated for further comment by the working party and CNOC. After any additional amendment it would be published in *Angewandte Chemie*, so that interested chemists might make suggestions prior to being issued as provisional IUPAC recommendations.

6. Section F: Natural Products and Related Compounds

Some minor changes were noted by CNOC, otherwise the document was approved in principle. Comments had been requested from CBN, after which Prof. KLYNE and Dr. CROSS would finalize it for publication as provisional recommendations. It was now thought to be worthwhile to reactivate the work on terpenes, particularly the Rowe proposals.

7. Biochemical Nomenclature

It was agreed that it might be advantageous in future to have three Commissions working in organic and biochemical nomenclature. CNOC should concentrate its activity on problems of general systematic organic nomenclature. A new IUPAC Commission should be created to work on the specialized nomenclatures of natural products of known structures excluding proteins, with membership from IUB.

CBN should become responsible solely to IUB and deal with nomenclature of biological products such as enzymes. These proposals would overcome the difficulty for CNOC to work simultaneously in the widely different areas of general systematic nomenclature and nomenclature of natural products.

Amino Acids. The document approved by CNOC and CBN had been issued as Provisional Nomenclature Appendix No. 46 (September 1975) to the *Information Bulletin*.

Lipids. The first-draft document (July 1975) had only just become available from CBN for comment by CNOC.

Lignins. Preliminary documents on nomenclature of lignins were being circulated within the working party (CROSS-Convenor).

Prostaglandins. A document (July 1975) was being distributed by Prof. P. KARLSON of CBN, asking for comments.

Tetrapyrroles. Detailed comments were made by CNOC on the tentative rules (May 1975) drawn up by the subcommittee under Prof. R. BONNETT.

Carbohydrates. Reconsideration of 'Carbohydrate Nomenclature—1' (issued by IUPAC in September 1970 as Tentative Nomenclature Appendix No. 7 to the *Information Bulletin*) was being undertaken by a working party with Prof. H. PAULSEN as convenor. Documents were also under active preparation on unsaturated monosaccharides, branched-chain saccharides, and conformation of monosaccharides.

Phospho Diesters. A document on 'Nomenclature of Phosphorus-containing Compounds of Biochemical Importance' from CBN was distributed during the meeting.

Carotenoids. The revised rules were to be published in *Pure and Applied Chemistry* **41**, 405 (1975) and reprints would be on sale from the IUPAC Secretariat.

8. Collaboration with CNIC

Three joint sessions were held at Santiago with CNIC to discuss questions of common interest. Agreement was reached on how to proceed with respect to deciding seniority between nuclides, use of the revised lambda convention in organic nomenclature, a completely systematic method for naming hydrides of the elements, methods for hydride

anions, ylidene and ylidyne vs. dilyl and triyl, etc. In addition, three new joint CNOC - CNIC working parties were created to study:

Organic and Inorganic Sulfur Compounds

Cryptates and Polydenate Ligands

Heteroatomic Chains and Rings and General Replacement Nomenclature

9. Membership

To promote the continuity of the work of the Commission, it was agreed to nominate Prof. J. RIGAUDY to serve as Vice-Chairman. An active and continuing effort was also needed to find qualified and interested chemists as Associate Members and eventually as Titular Members. Involving prospective Members in working parties was seen to be an appropriate method for assessing the interest of prospective Members.

10. Next Meeting

The 1976 meeting of CNOC was planned for the period 5 - 11 September at Deauville in France.

S. P. KLESNEY

COMMISSION ON NOMENCLATURE OF INORGANIC CHEMISTRY (CNIC)

Santiago de Compostela, 27 August - 2 September 1975

Present: Prof. W. C. FERNELIUS (Chairman), Dr. D. M. P. MINGOS (Secretary), Prof. R. M. ADAMS, Prof. L. F. BERTERLLO, Dr. K. C. BUSCHBECK, Prof. Y. JEANNIN, Dr. G. J. LEIGH, Dr. B. F. MYASOEDOV (Titular Members); Prof. K. A. JENSEN, Dr. W. H. POWELL, Prof. K. YAMASAKI (Associate Members); Dr. T. D. COYLE, Prof. E. FLUCK (National Representatives).

1. The minutes of the meeting held at Slaughman Manor, Sussex during 12 - 19 August 1974 [see *Information Bulletin* No. 49 (March 1975), pp. 48-51] were approved subject to slight amendments tabled by the Secretary.

2. The Commission stood in silence in memory of Prof. H. REMY (deceased 27 November 1974), a former Member. Prof. JENSEN was

- asked to write to Frau Prof. REMY expressing the Commission's condolences.
3. The Chairman reported that he would be meeting with the Commission on Colloid and Surface Chemistry at Madrid in September to consider comments on 'Chemical Nomenclature, and Formulation of Compositions, of Synthetic and Natural Zeolites' [Provisional Nomenclature Appendix No. 41 (January 1975) to the *Information Bulletin*].
 4. A document on isotopically modified inorganic compounds had been drafted by Prof. FERNELIUS and would be considered when the Organic Nomenclature Commission had completed its work in this area.
 5. The Chairman reviewed developments concerning the Commission's proposal for naming the elements with $Z > 106$. The Commission reaffirmed that there was a need for systematic names and symbols for these elements and expressed disappointment at the Bureau's decision not to recommend the system suggested by the Commission at Munich in 1973. The Chairman was instructed to communicate these views to the appropriate IUPAC authorities.
 6. The Chairman reported that the publication of 'How to Name an Inorganic Substance' and the revision of Table II of *Nomenclature of Inorganic Chemistry* (the Red Book) was currently being discussed with the IUPAC Secretariat. It was hoped that these documents would be published in a variety of journals and with IUPAC approval. Members were encouraged to proceed with translations of these documents from the original English. Prof. ADAMS requested that the relationship between the revised Table II and Table V of the Red Book be clearly stated.
 7. Prof. FERNELIUS indicated that progress had been made on the problem of stereochemical notation. The Commission had agreed to adopt the symmetry labels proposed by SLOAN, BROWN, and COOK of Chemical Abstracts Service, but not the chirality symbols.
 8. The Commission welcomed Chemical Abstracts' liberal distribution of working documents prior to publication. Dr. POWELL requested that the confidentiality of these documents be rigidly respected.
 9. The Chairman reported that Dr. CHEESEMAM was diligently at work preparing a history of the Commission. He requested that Mem-

bers send Dr. CHEESEMAM any photographs they might have of previous meetings of the Commission.

10. The Secretary summarized a letter from Prof. B. C. L. WEEDON, Scientific Editor of the Union, concerning the adoption of IUPAC Nomenclature recommendations in IUPAC publications. The letter confirmed that it was general policy to encourage their use whenever possible.

11. The Commission discussed whether it should be responsible for specific forms of the Periodic Table and passed the following resolution unanimously:

The Commission believes that the Periodic Table is a valuable method for classifying the elements. It recognizes that various forms of the Periodic Table may be designed for particular purposes. It believes that it is desirable that such a table portray groups, periods of differing lengths, A and B subgroups, transition elements, and the accepted chemical families. The Commission does not recommend any further requirements and the specific form of a given table should be the concern of the designer alone. The Commission does not consider the endorsement of any particular table to be within its terms of reference.

12. The Commission regreted that the term *relative atomic mass* was published without reference to the *Commission on Atomic Weights* and passed the following motion:

The Commission recognizes that neither the term *atomic weight* nor the term *relative atomic mass* is completely satisfactory for describing the concept normally understood by the term *atomic weight*, but considers that for reasons of history and usage the term *atomic weight* be retained. The Chairman was instructed to express the views of the Commission at the meeting of Interdivisional Committee on Nomenclature and Symbols at Madrid in September.

13. The Commission expressed sympathy with Prof. W. KLEMM'S suggestion for uniform international names for the chemical elements, but considered that chemists would not accept the fundamental changes that would be necessary. The Commission did agree to add the following names in parenthesis as alternatives in Table I of the Red Book:

stibium after antimony

natrium after sodium

kalium after potassium

The term *natride* for the Na^- ion was approved.

14. Drs. POWELL and LEIGH introduced their papers on the *kappa* notation. Their recommendations met with general approval and they were requested to prepare a document for publication. This document, which would be considered in detail at the next meeting, should be ready for circulation to Commission members by March 1976.

15. The Commission discussed at great length Prof. JENSEN'S recommendations for ring and chain nomenclature. There was considerable disagreement on whether such a nomenclature system should be based on substitutive, coordination, or hetron nomenclature principles. Dr. MINGOS suggested an alternative approach, based on the mathematical concept of a graph, and it was agreed that a working party be set up with the following terms of reference:

That it should produce a positive recommendation based on the concept of a graph for chain and ring nomenclature and justify it with respect to previous approaches to this problem.

The working party, which would consist of Drs. LEIGH, POWELL, and MINGOS, and Prof. ADAMS, would collaborate with members of the Organic Nomenclature Commission who were working in related areas. Dr. POWELL was asked to provide suitable examples for testing the proposals.

16. Nomenclature problems raised by the polyhedral boranes and cluster compounds were discussed. It was agreed that the numbering rules for polyhedral boranes were not consistent with the numbering rules for coordination compounds given in the Red Book. The Commission recommended that the latter be modified to conform as closely as possible to current boron practices. Prof. ADAMS and Dr. POWELL were asked to consider the problems which might arise from this decision.

The Commission discussed the proposals of Prof. ADAMS and of Mr. SLOANE for the symbolic representation of triangulated polyhedra. Prof. COTTON'S suggestion that a graph theory approach be adopted was also explored. It was agreed that none of the systems currently available provided a satisfactory basis for recognizing the geometrical features of a polyhedron. Dr. MINGOS volunteered to investigate the possibility of devising a satisfactory system based on names rather than symbols. The Commission emphasized that this problem required urgent solution.

Extension of the *debor* principle to open metal clusters was agreed.

17. Prof. BERTELLO presented his document on 'Nomenclature of Highly Fluorinated Inorganic Compounds'. The Commission agreed that such compounds would be ideal for demonstrating the extension of coordination nomenclature principles to nonmetallic compounds. Profs. JEANNIN (Convenor) and BERTELLO and Drs. BUSCHBECK and MYASOEDOV were requested to prepare a document on this subject for consideration at the next meeting. The following terms of reference were suggested:

- (a) The rules are to be framed as widely and generally as possible and that terms such as *holo-* should be added only as a means of subsequent simplification.
- (b) The document must contain a clear statement of the implications of the oxidation state formalism.
- (c) The criteria for determining which atom of a group is the coordination centre should be those suggested in Prof. BERTELLO'S document, subject to the following modification - the atom with the highest coordination number has first priority.

The principles of -io radical nomenclature would be the subject of another document, to be prepared by Drs. LEIGH and MYASOEDOV and Profs. CHATT and BERTELLO. This document was of interest to the Organic Nomenclature Commission, which requested that it contain a clear definition of the "-io operation".

18. Dr. POWELL discussed the basic principles of substitutive nomenclature and introduced the document 'Systematic Names for Molecular Hydrides'. In the discussion which followed the following topics were raised:

- (a) the systematic names for water, ammonia and germanium tetrahydride,
- (b) halogen hydrides,
- (c) allane and its congeners,
- (d) putative inert gas hydrides.

The Commission agreed to use Dr. POWELL'S document as a basis for discussion with the Organic Nomenclature Commission (see 25 below). The systematic name for water was changed to oxygenane. A motion to adopt germanane in place of germane was defeated by the Chairman's casting vote. It was subsequently agreed to retain germane for GeH_4 and to use the name *germide* rather than *germanide* for Ge^{4-} . The Commission recommended that a footnote be added to Dr. POWELL'S document indicating why the hydrides of aluminium, gallium, and indium had not been included in the discussion.

19. Dr. POWELL reported on the discussions of a joint working party (with the Organic Nomenclature Commission) on cation, anion, and radical names. It was decided that the current practice of using -ium, -yl, and -ide endings would be retained.

The Commission agreed on the following recommendation for anion name endings:

That the -ide endings be used for anions formed by the loss of a proton from the skeletal system of a molecular hydride which has been named by the rules proposed by Dr. POWELL in 'Systematic Names for Molecular Hydrides'. The -ate ending should be reserved for anions derived by the loss of a proton from oxygen or sulfur substituents of molecular hydrides and for anionic coordination entities.

20. Prof. CHATT'S amended document 'Nomenclature of Hydrides of Nitrogen and derived Anions and Ligands' was discussed in detail. He should be asked to introduce the following order of priorities for ligand names into Section 1.4 of the document:

(a) If possible, name the ligand as a neutral molecule which has no charge separation. Failing that as an anion (not a radical) with the lowest possible total charge. The formal charge on the ligand will then generally be 0 or -1 .

(b) A ligand which cannot be named in accordance with (a) will have a charge separation when named as a neutral molecule or carry more than one negative charge when named as an anion. The latter is preferred.

The Commission requested that a table which clearly indicated these priorities should be added. Many detailed modifications to Prof. CHATT'S document were also suggested.

21. The problem of handling the upper case letter abbreviations was raised by Dr. BUSCHBECK. The Commission agreed to strengthen the wording of the statement dealing with this topic in the Red Book when it was next revised. Dr. BUSCHBECK was requested to prepare a document on abbreviations for consideration at the next meeting.

22. Prof. JEANNIN stated that the nomenclature of three dimensional heteropolyacids required study and agreed to prepare a paper on this subject.

23. The Commission recognized that the area of bioinorganic chemistry would pose many problems of nomenclature and asked Prof. FERNELIUS to write to Profs. KENNY and EICHORN for their advice on possible future developments in this area. The nomenclature of Macrocyclic ligands seemed to require particularly urgent study.

Dr. LEIGH was asked to join the Organic Nomenclature Commission's working party (Prof. RIGAUDY and Drs. POWELL and GRÜNEWALD) dealing with the nomenclature of crown ethers and cryptates.

24. The following Titular Members were nominated for a second four-year term: Prof. BERTELLO, Dr. BUSCHBECK, Prof. JEANNIN, Dr. MYASOEDOV.

Prof. CHATT and Dr. POWELL were nominated as new Titular Members to fill the vacancies arising from the retirements of Profs. FERNELIUS and ADAMS. Prof. JEANNIN was nominated Vice-Chairman of the Commission. Associate Members who were eligible to continue were reconfirmed and Profs. ADAMS and FERNELIUS were nominated as new Associate Members. The Secretary was asked to arrange a postal ballot of Titular Members to elect a Chairman once the new membership of the Commission had been confirmed. Prof. K. SAITO was approved as the National Representative for Japan.

25. Joint meeting with Organic Nomenclature Commission in Santiago:

(a) Prof. FERNELIUS reported that the Inorganic Nomenclature Commission would follow the Organic Nomenclature Commission's recommendations for isotopically modified compounds.

(b) The Inorganic Nomenclature Commission provisionally accepted the Organic Nomenclature Commission's suggested modification of the *gamma* convention which used subscripts to indicate the charge on the atom.

(c) The Organic Nomenclature Commission raised no objections to the alteration of *oxidane* to *oxygenane* as the systematic name for water in Dr. POWELL'S document 'Systematic Names for Molecular Hydrides'.

(d) Prof. N. LOZAC'H reported that the Organic Nomenclature Commission would probably accept Dr. POWELL's simplified rules for deriving radical names.

(e) There was general acceptance for the proposal that the endings *-ylidene* and *-ylidyne* be retained in a restricted sense for radicals where bonding occurs from one atom only.

(f) The Inorganic Nomenclature Commission would prepare a document on *-io* radical names (see 17 above).

(g) Prof. FERNELIUS reported that the Inorganic Nomenclature Commission was working on documents which would give a more

satisfactory description of the modes of attachment of the ligands discussed on pages 125-138 of Section D: Tentative Nomenclature Appendix No. 31 (August 1973) to the *Information Bulletin*.

(h) The Organic Nomenclature Commission agreed to the use of *icosa* rather than *eicosa*. Dr. POWELL stated that he saw no reason why *Chemical Abstracts* could not in time incorporate the shorter form into its indexes, but he could not say when this would be done.

26. At a meeting with Prof. O. HOFFMANN-OSTENHOF, Chairman of IUPAC-IUB Commission on Biochemical Nomenclature (CBN), to discuss the tetrapyrrole nomenclature document prepared by Prof. R. BONNETT, the Inorganic Nomenclature Commission had certain reservations because it did not conform consistently with IUPAC nomenclature practices, but recognized that Prof. BONNETT had produced a reasonable compromise document. Therefore, the Commission agreed to its publication, subject to certain modifications. Dr. MINGOS was asked to discuss the suggested modifications with Prof. BONNETT.

D. M. P. MINGOS

MACROMOLECULAR DIVISION WORKING PARTY ON STRUCTURE AND PROPERTIES OF COMMERCIAL POLYMERS

Welwyn Garden City, 26 - 27 November 1975

Present: Dr. A. J. DE VRIES (Rhône-Poulenc, Antony—Chairman), Dr. M. E. CARREGA (Rhône-Poulenc, Aubervilliers—Secretary), Dr. G. AJROLDI (Montedison, Bollate), Dr. C. B. BUCKNALL (Cranfield Institute of Technology), Dr. J. CHAUFFOUREAUX (Solvay, Brussels), Dr. P. L. CLEGG (ICI, Welwyn Garden City), Dr. M. FLEISSNER (Hoechst, Frankfurt/Main), Mr. G. V. GOTHAM (ICI, Welwyn Garden City), Dr. J. HEIJBOER (TNO, Delft), Dr. R. JACOB (Solvay, Brussels), Dr. W. RETTING (BASF, Ludwigshafen), Dr. S. TURNER (ICI, Welwyn Garden City), Dr. J. ZELINGER (Technical University of Prague).

1. Minutes of Previous Meeting

The minutes of the meeting held at Paris on 19 - 20 June 1975 [see *Information Bulletin* Nos. 50/51 (November 1975), pp. 124 - 127] were approved. The Chairman confirmed that the report by CHAUF-

FOUREAUX on the tensile properties of rigid PVC had been submitted for publication in the journal *Pure and Applied Chemistry*. The report by JONES on oriented polystyrene would be published in a forthcoming issue of the journal, as well as the report by MEISSNER on low-density polyethylene. With respect to the report by WALES on PVC rheology presented at Madrid and published in the *J. Polymer Sci.: Symposium no. 50*, 469 - 485 (1975), the Chairman reminded that all final reports of the Working Party had to be submitted for publication by the Chairman himself to the IUPAC Secretariat, which unfortunately had not been the case for WALES' report. Since the latter report would not be published in the journal, WALES was requested to send 50 reprints of his paper to the IUPAC Secretariat in Oxford for distribution to the members of the Macromolecular Division and the Working Party.

2. Mechanical Properties of Rigid PVC Programme

CHAUFFOUREAUX presented the first progress report on the second part of the programme concerned with the effect of fillers. This report was extensively discussed together with the latest interim reports by Montedison and ICI.

It was apparent from the discussion that the initial aim of studying the effect of calibrated defects by means of introduction of fillers of different particle size had not been completely successful because of the agglomeration of fine fillers. However, the results obtained did not allow yet a clear distinction to be made between the effect of filler size and the effect of agglomerates. Another effect not yet understood was the difference observed in the effect of annealing on the mechanical properties of samples containing different fillers (difference between stock I and II in Montedison's results). The results on impact resistance obtained in this programme confirmed that the characterization of this important technological property is still a problem which deserves further study in view of the elaboration of significant tests. Finally the effect of fillers on intermittent loading and dynamic fatigue results had not received a satisfactory explanation.

After reception of ICI's final results (1st January 1976) CHAUFFOUREAUX would write the second progress report before February 29, 1976 and send it to all members of the Working Party. Comments should be sent to CHAUFFOUREAUX before the end of March 1976 in order to allow him to write the Final Report before the next meeting scheduled for June 24 - 25.

3. Oriented High Impact Polystyrene Programme

RETTING and ZELINGER presented the first progress report. Because of the large amount of data compiled in this report it was not possible to discuss in detail all items. All participating members were requested to study this report carefully and to send their comments and supplementary informations to RETTING and ZELINGER before March 1, 1976. The following points in particular, discussed to a certain extent, require further elucidation and analysis: (i) the discrepancies between the result of different laboratories concerning \bar{M}_n determined by GPC; (ii) the actual cause of the difference in T_g of the rubber phase in the two samples; (iii) the significance of various methods used to determine the gel content; (iv) the effect of the draw ratio on the observed deformation of rubber particules determined by microscopy; (v) from the results of TNO on shrinkage measurements, the amount of biaxial orientation in the drawn specimens delivered by BASF should be calculated; (vi) the characterization of molecular orientation either by modulus or by linear thermal expansion measurements appeared to be insufficient and not fully understood; (vii) total shrinkage force should not be considered in general as directly related to molecular orientation; the conclusions of the report of JONES on this point should be reconsidered; (viii) the disagreement between the results on creep obtained in different laboratories.

4. Proposals for Future Programmes

Most of the members had communicated to the Secretary their preferential ranking of the 22 items (excepted Firestone, Huels, Monsanto, Shell, Prof. LODGE, Prof. MEISSNER and Prof. VINOGRADOV).

For this meeting only the programmes on mechanical properties were considered at the meeting in Amsterdam. According to the preferences indicated by each member a number between zero and three was assigned to each proposal, the highest preference being indicated by number three.

Results obtained in this way are given in appendix to these minutes. It appeared that two of the proposals for mechanical properties programmes had highest preference i.e. proposal 4: study of impact strength testing and its reference to real mouldings, and proposal 21: effect of molecular orientation on mechanical properties of polymers.

TURNER outlined the general background of proposal 4 and the possible ways of investigating the problem of impact resistance of dif-

ferent parts of a moulded object. In the discussion about the most suitable shape of the moulding to be used AJROLDI brought forward that MONTEDISON had already done some work in this field and could possibly provide samples to be tested in this programme. It was decided that TURNER would write a draft proposal for detailed discussion at the next meeting which might take place in June 1976. The proposal would be sent by TURNER to all members of the Working Party as soon as possible (before the end of February).

Concerning proposal 21, DE VRIES would prepare a draft in due time to be also discussed at the next meeting.

5. IUPAC Macromolecular Division

The Chairman reported on the meeting of the Macromolecular Division Committee held in Madrid during the first week of September 1975. The creation of a new Commission entitled: "Polymer Characterization and Properties" was confirmed. This Commission under the Chairmanship of Dr. BARRETT would in particular consider and discuss topics to be investigated by existing or new Working Parties. Members of this Commission are the Chairmen of the actual four Working Parties; besides our Working Party the one on molecular characterization (Chairman Dr. BALL, BASF), the one on thermodynamic properties (Chairman Dr. WILSKI, Hoechst), and the one on supported polymer films (Chairman Mr. FINK-JENSEN, Sadolin). New officers and members of the Division were elected during this meeting of which the composition is as follows: C. OVERBERGER (President); V. KABANOV (Vice-President); A. J. DE VRIES (Secretary); H. BENOIT (Past-President); R. SCHULZ, A. NAKAJIMA, C. BAMFORD, F. WINSLOW, P. CORRADINI, F. TUDÖS (Members); M. MANDEL, D. HEINZE, J. H. SAUNDERS, A. KEPES, V. VAKULA, O. WICHTERLE (Coopted Members).

Because of the election of DE VRIES as Secretary of the Division a new Chairman for the Working Party should be designated. Since there are no rules for nomination of a Chairman nor for its term of office, DE VRIES suggested that for this time we would proceed to a simple nomination with general consensus of the members. Dr. HEIJBOER being the oldest and one of the most active members would be the most logical choice, but HEIJBOER thought that a representative of a large industrial company should be chosen instead. Taking account of the need for a person having broad industrial ex-

perience in the main fields of activity of the Working Party (rheology and mechanical properties) DE VRIES proposed to nominate Dr. CLEGG who had shown a keen interest in the activity of the working party although his membership was of recent date. All members present at the meeting agreed with this choice, but it was decided to consult all members by letter.

6. Membership

Monsanto had made known that its new representative would be:

George E. WALKER
Monsanto Technical Center
Parc Scientifique
Rue Laid Burniat
B-1348 LOUVAIN LA NEUVE (Belgium)

7. Date and Place of Next Meetings

The next meeting on mechanical properties programmes was decided to be held on 24, 25 June 1976; AJROLDI would inform the Secretary about the possibility of holding this meeting in Italy.

It was reminded that the next meeting devoted to rheology programmes would be held in Amsterdam on 19, 20 August 1976.

M. E. CARREGA

COMMITTEE ON PUBLICATIONS

Oxford, 24 - 25 May 1976

Present: Prof. G. OURISSON (Chairman), Dr. L. C. CROSS (in part), Dr. H. GRÜNEWALD (in part), Prof. C. F. CULLIS (IUPAC Scientific Editor). In attendance: Mr. I. R. MAXWELL, Mr. H. HOLT (Pergamon Press, in part), Dr. D. N. KIRK (IUPAC Assistant Scientific Editor), Dr. M. WILLIAMS and Mr. P. D. GUJRAL (IUPAC Secretariat).

1. Minutes of Previous Meeting and Matters Arising

The Minutes of the meeting held in Madrid on 2 September 1975 (see *Comptes Rendus 28th Conference: Part B*, pp. 98-105) were ap-

proved. The Executive Secretary reported on royalty received in respect of 1975 from the original tearsheet service operated by Institute of Scientific Information for *Pure and Applied Chemistry*. Dr. GRÜNEWALD suggested that ISI be requested to supply details of the basis of these royalties: an indication of the number of tearsheets and which papers were involved would be a useful indicator of demand for PAC if taken over several years.

2. Completion of Publishing Programme with Butterworths

The royalty payable to the Union for 1975 by Butterworths was considered. Although income from *Pure and Applied Chemistry* was up on that for 1974, there was a further decrease in income from other publications. It was noted that the privilege for Company Associates to obtain PAC at half cost had been withdrawn at the end of 1975. A modest royalty was still forthcoming for 1975 in respect of *Enzyme Nomenclature 1972* from Elsevier.

With the distribution of Vol. 44, No. 4 in March 1976, Butterworths had completed its responsibility for PAC. Pergamon was to be entirely responsible for marketing the symposia offprints from several 1975 issues of the journal as well as of the volume on *Carbon Dioxide* in the *International Thermodynamics Tables of the Fluid State* series.

3. 1975 IUPAC Publications Account and 1976 IUPAC Publications Budget

The first formal separation of publication income and expenditure from that for general purposes of the Union had been effected in the 1975 IUPAC accounts. Allocation of income and expenditure, especially distribution of Secretariat costs, would be refined and improved with further experience. There was a small excess of income over expenditure for publications in 1975.

Because arrangements for handling the *Information Bulletin* and *Comptes Rendus* this year had not yet been fully decided, it was difficult to prepare a realistic publications budget for 1976. Nevertheless, the Committee on Publications stressed the importance of having a better balance between costs of printing - distributing the *Bulletin* and *Comptes Rendus* and between subscription income for the *Bulletin* plus IUPAC subsidy for providing free copies of these publications.

4. Membership

Prof. OURISSON referred to the sad and unexpected death recently of Dr. R. L. KENYON. Two persons were now needed to complete the full complement of 8 Members. In addition, a replacement Chairman was required because of the duties of Prof. OURISSON as Secretary General of the Union. Some names were considered by the Committee for recommendation to the Bureau. Prof. OURISSON was asked to press the International Company Associates Group - Applied Chemistry Division for an industrial nominee.

5. Review of Scheme for IUPAC News in National Chemical Journals

Since the end of 1971, the Secretariat had been distributing items of IUPAC news for consideration of publication in national chemistry news journals. Dr. GRÜNEWALD reiterated his view that information made available by the Secretariat to editors could be improved for it to be used more frequently and widely. A proposal from the Executive Secretary for evaluating the news journals scheme was accepted: where the Secretariat had no indication that IUPAC news was being included in a particular journal, the relevant National Adhering Organization would be asked to check and to try to improve the position, otherwise the journal should be eliminated from the scheme.

6. Distribution of International Newsletter on Chemical Education

Brief consideration was given to the mail plan for distributing Newsletter No. 3 (December 1975), but no suggestions were made for wider dissemination in future. Dr. GRÜNEWALD had advised on preparation of the covering letter to editors of national chemical news journals. Prof. OURISSON thought that some material from the Newsletter might advantageously be included in any "Trends" publication started by the Union.

7. Miscellaneous Matters

(i) A Guide to the use of *Nomenclature of Inorganic Chemistry* (The Red Book) was to be published as a supplement to the Red Book by printing by offset litho directly from the typescript to be provided by the Commission on the Nomenclature of Inorganic Chemistry.

(ii) A revised version of the 'Catalogue of Reference Materials' was agreed to be published in *Pure and Applied Chemistry*.

(iii) It was recommended that an 'IUPAC Data Series' be started for such publications as 'Equilibrium Constants of Liquid-Liquid Distribution Reactions' with Parts 3 (Compounds - forming Extractants, Solvating Solvents, and Inert Solvents) and 4 (Chelating Extractants). The Committee noted that Parts 1 and 2 had been published as separate publications outside PAC. The forthcoming series 'Critical Surveys of Stability Constants of Metal Complexes' would also be included in the Data Series. Dr. GRÜNEWALD strongly recommended that all such material should be made available only in microform.

8. Matters Arising with Pergamon

(i) Several aspects of improving the language, presentation, and proofing of symposia papers received for publication in PAC were brought to the attention of the Committee by Prof. CULLIS. Mr. MAXWELL instructed his editorial staff to exercise proper quality control over the material proofed-out by the printer.

(ii) The Committee noted that agreement by correspondence had been reached for IUPAC to purchase additional reprints of Commission reports in PAC at a discount of 55% of the normal Pergamon rate.

(iii) Mr. MAXWELL proposed to seek IUPAC's help to initiate exchange advertisement agreements with national chemical societies and a priority exchange facility for book reviews. This could necessitate the introduction of book reviews in either PAC or in the *Information Bulletin*.

(iv) Dr. WILLIAMS reported that Pergamon was going ahead with the production of *Comptes Rendus 28th Conference, Part A*. He anticipated that *Part B* might also be produced by Pergamon. The sale price agreed for Parts A and B was US-\$40 (£20) although IUPAC would be supplied with *ca.* 1300 copies at cost for free distribution within IUPAC.

(v) *Information Bulletin* would also be produced and marketed by Pergamon. The up-to-date subscribers list had been passed on to Pergamon. The 1976 subscription rates of US-\$12 (£6) by surface post and US-\$22.50 (£11.50) for airmail had been agreed by Executive Committee. IUPAC would buy the number of copies needed for distribution free-of-charge within IUPAC at actual cost.

Production of the Appendices to the Bulletin, their distribution and *gratis* copy service would continue to be handled by IUPAC Secretariat, with Pergamon buying the required copies at cost for subscribers to the Bulletin.

(vi) Prof. OURISSON said that Pergamon had agreed to handle the two projects 'Solubility Data' and 'Stability Constants'. Mr. MAXWELL preferred to market publications arising from these projects in hardform with the provision to discuss microform editions later.

(vii) The Committee agreed with Pergamon to have one annual volume of 12 issues for PAC from 1977 as against 4 volumes of 4 issues each at present. The annual subscription for 1977 would be US-\$220 (+ US-\$20 for postage and handling), the price in UK would be £100.

(viii) The Committee decided to recommend acceptance of the proposals of Pergamon in respect of Microform versions of PAC, viz. to make available a microform version for subscribers to PAC at 80% of the hardform journal price, but to nonsubscribers at the same price as for hardform edition.

9. Selection of Symposia for PAC

After considering several aspects of selection of and materials from Symposia the Committee concluded that an entirely new approach was needed for the future appointment of Symposium Editors. Detailed instructions (selectivity, quality, provision of camera-ready copy), in the form of a letter would be sent under the signature of the Scientific Editor, calling for more help from Symposium Editors and that organizers must cooperate fully regarding publication requirements of the Union (to be incorporated in the Advance Information Questionnaire).

In order to help a Symposium Editor to discharge his extended duties, Mr. MAXWELL agreed that Pergamon would provide, in addition to the \$2 per page of acceptable camera-ready copy, an honorarium of \$100. He preferred the honorarium to be provided 50:50 by the publisher and the Union.

10. Review of Present Range of IUPAC Publications

Memoranda on the publishing policy of IUPAC, prepared in 1972 by Dr. GRÜNEWALD and the late Dr. KENYON, together with the dis-

cussion of the matter by the Committee on Publications that year had been recirculated prior to the meeting. More recently the Bureau had asked the Committee on Publications to make a study of methods of improving the transfer of information on IUPAC, and the British National Committee for Chemistry had submitted some comments on IUPAC publications. After a thorough review of the present very complicated range of IUPAC publications, the following was agreed as a better structure for the future:

(i) *Pure and Applied Chemistry* to continue as a journal, but confined to review papers and still based on lectures given at IUPAC symposia.

(ii) The *Information Bulletin* to be reshaped into an IUPAC News Bulletin, with journal character and appearing at regular intervals; to contain nomenclature recommendations and other Commission reports presently issued in PAC, material presently issued as Appendices to the Information Bulletin and all relevant material from the present Bulletin and Comptes Rendus. The *Comptes Rendus* should be discontinued.

A policy decision would be needed from the Bureau on whether the reshaped Bulletin should be distributed free to members of IUPAC bodies.

(iii) Monographs, to include material presently issued separately from PAC, possibly under the title "IUPAC Chemical Reference Books".

(iv) Data, numerical or otherwise, under the title "IUPAC Chemical Data Series". Although microform would eventually be the usual commodity, for the time being material should also be issued in hardform.

Prof. OURISSON was asked to seek the approval of the Executive Committee for the proposed new publications structure. This would enable more detailed arrangements to be made with Pergamon as soon as possible.

Prof. CULLIS and Mr. MAXWELL thought that it was worth considering expansion of PAC to include reviews not presented at IUPAC symposia. Dr. WILLIAMS pointed out that Guidelines approved by the Executive Committee (Paris: 1973) envisaged that organizers should plan their meetings so as to make available for publication 6 - 12 main lectures, some of which should survey critically the state of the particular field of research, giving pointers to future work. Prof.

CULLIS said that organizers might even wish to invite an international expert to produce a review for publication in PAC when that person was unable to participate in the symposium itself.

11. Date and Place of Next Meeting

The next regular meeting of the Committee on Publications would be during the course of the 29th IUPAC General Assembly to be held in mid-1977 at Warsaw.

M. WILLIAMS

COMMISSION ON MACROMOLECULAR NOMENCLATURE (IV.1)

Dorking, 7 - 11 June 1976

Present: Dr. K. L. LOENING (Chairman), Dr. R. B. FOX (Secretary), Prof. P. CORRADINI, Prof. A. D. JENKINS, Dr. W. RING, Prof. P. SIGWALT, Prof. T. TSURUTA (Titular Members); Dr. L. C. CROSS, Dr. H. WILSKI (Associate Members). Prof. R. WETTON (UK, sponsored by the Wates Foundation) (Observer).

1. The minutes of the previous meeting held in Madrid, 2 - 6 September 1975 (see *Comptes Rendus 28th Conference: Part B*, pp. 239 - 242) were approved.

2. Composition of the Commission

A number of Titular Members would be completing their terms in 1977; replacements or possible term extensions, as well as candidates for Associate Membership were considered.

3. Structure-Based Nomenclature for Single-Strand Regular Polymers

Minor editorial changes were made in this document which had been published in November 1972 as Provisional Nomenclature Appendix No. 29 to the IUPAC *Information Bulletin*. Free-radical repeating units, e.g. $\dot{\text{C}}\text{HCH}_2$, were discussed, but no decision reached on their nomenclature. The amended and corrected Appendix 29 was forwarded to the IUPAC Secretariat for publication as a final document of the Commission in the journal *Pure and Applied Chemistry* (scheduled for publication in Vol. 48, No. 3).

4. Nomenclature of Copolymers

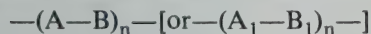
The draft of 13 May 1976 (by W. RING) was discussed in detail, and the following decisions were made.

(i) *Scope*. This nomenclature applies to copolymers and to polymers that can be regarded as derived from more than one species of monomer. For example, the substance obtained by the copolymerization of styrene and 4-chlorostyrene and the substance obtained by the partial chlorination of poly(styrene) in the 4-position of the benzene ring will both be regarded as copolymers. Polymers having more than one kind of monomeric unit derived from a single monomer species will not be regarded as copolymers. Examples are mixed 1,2 and 1,4 monomeric unit poly(butadiene), mixed head-tail and head - head poly(styrene), and polymers having different configurational units derived from one monomer.

(ii) *Citation and Symbolology*. The essentially source-based nomenclature of non-crosslinked copolymers will be based on the name 'poly(X)', in which (X) will be a source-based description of the monomeric units comprising the copolymer chain. A random arrangement of monomeric units A and B will be designated by a *comma*: poly(A,B); an unspecified arrangement will be designated the *solidus*: poly(A/B). Block arrangements will be shown by a *dash* connecting the names [poly (A) for—A_n—, etc.)] of the blocks. Examples of block arrangements and their type names are (subscripts k, m, n are high and indeterminant; x and y are low and indeterminant):

—A _k —B _m —	Poly(A) - poly (B)
—A _k —B _m —A _k —	Poly(A) - poly(B) - poly(A)
—(A _k —B _m) _n —	Poly[poly(A) - poly(B)]
—(A _x —B _y) _n —	Poly[oligo(A) - oligo(B)]
—(A ₄ —B ₃) _n —	Poly[tetra(A) - tri(B)]
—(A _x —B _n) ₄ —	Tetra[oligo(A) - poly(B)]

The order of citation of the block names will be that found in the copolymer chain, reading left to right. Random arrangements of blocks will be named poly [poly(A), poly(B)]; unspecified block arrangements will be shown by poly[poly(A)/poly(B)]. An alternating arrangement of single monomeric units will be shown by either a dash or the infix *alt*:



Poly[(A) - (B)]

or Poly[(A) - alt - (B)]

Graft arrangements will be shown by a *plus* sign between the name (cited first) of the chain, block, or unit at which the graft occurs and the name of the grafted chain:

An average of eight poly(acrylonitrile) grafts per poly(styrene) chain:

poly(styrene) + octa[poly(acrylonitrile)]

A single graft of poly(styrene, acrylonitrile) at the butadiene block of a diblock copolymer of butadiene with styrene:

{poly(butadiene) + mono[poly(styrene, acrylonitrile)]} —
poly(styrene)

or poly(butadiene)—butadiene + [poly(styrene, acrylonitrile)]—
poly(butadiene)—poly(styrene)

A copolymer containing a trifunctional (or higher) monomeric unit will be considered to be a graft copolymer.

(iii) *Limitations.* For the present, cyclic and 'tapered' copolymers will not be given a special symbol. 'Star' copolymers in which the (copolymer) blocks attached to the central atom are equivalent will not be included in the graft copolymer category.

(iv) *Copolymers having regular structure.* Copolymers having constitutionally regular structures, e.g. alternating copolymers, may be named on a structure basis (cf. Minute 3). Structure-based names for constitutionally regular blocks were not adopted as an alternative means of naming copolymers.

(v) *Additional descriptors.* For emphasis, additional descriptive terms such as 'random', 'block', 'graft', etc. may precede simple copolymer names. For example:

Graft poly(styrene) + poly(ethylene oxide)

Block poly(butadiene)—poly(styrene)—poly(butadiene)

(vi) *Revised draft of copolymer nomenclature.* Dr. RING will undertake to write a revised version of the copolymer nomenclature proposals for further consideration by the Commission.

5. Stereochemical Definitions and Notation Relating to Polymers

Editorial revision of the Stereochemical document (cf. Madrid meeting of the Commission) was made by a Task Force of the Commission. This version, with editing undertaken by Prof. JENKINS, will be distributed to the Commission by the Chairman before final adoption by the Commission.

6. *Subsidiary Definitions*

(i) *Tsuruta document of August 1975.* The definition of *polyaddition* would be deleted; the definition of *polycondensation* would be reexamined in the light of usage. The terms 'stereoselective polymerization' and 'enantiomeric polymerization' would be reserved for future consideration. A definition of 'Spiro polymers' would be added. 'Monodisperse' and 'polydisperse' would be deleted and 'molecular weight' would be changed to 'molar mass'.

(ii) *Definitions involving physical properties of polymers.* It was agreed that a separate document on Basic Definitions of Physical Properties Relating to Polymer Characterization was desirable and that the appropriate terms should be moved from the Subsidiary Definitions document. A Task Force [RING (Chairman), WILSKI, and BIKALES] would prepare a preliminary draft for consideration at the next meeting of the Commission. Dr. WILSKI will coordinate interaction between this Commission and Commission IV.2.

(iii) *Molar Mass.* The Commission endorsed the use of the term 'molar mass' (symbol M) in a polymer context, along with the terms 'mass average molar mass' and 'number average molar mass'. The Commission recommended that the term 'molecular weight' be abandoned in favor of 'relative molecular mass' (symbol M_R).

7. *Inorganic Polymers*

Pending consideration by the Commission on Inorganic Nomenclature, no action was taken on a proposal in this area by Polymer Division Nomenclature Committee of the American Chemical Society.

8. *Exchanging Sorbents*

A published proposal in this field was reviewed. This proposal was not consistent with Commission IV.1 and other IUPAC recommendations; its revision and resubmission to this Commission was to be encouraged.

9. *Other Business*

Limited discussions were carried out on the nomenclature problems of interpenetrating networks, polymer classification, and the ISO Rubber Vocabulary. No actions were taken.

10. *Next Meeting*

The next meeting of the Commission would be held in Warsaw in 1977 at the time of IUPAC 29th General Assembly.

R. B. FOX

COMMITTEE ON TEACHING OF CHEMISTRY

Frankfurt, 18 - 19 June 1976

Present: Prof. C. N. R. RAO (Chairman), Mr. D. G. CHISMAN (Secretary), Prof. M. LAFFITTE, Prof. D. VITOROVIC (Members); Prof. B. NEWBOLD (Canada), Dr. H. SADEK (Egypt), Dr. U. HOFACKER (Federal Republic of Germany), Dr. A. BARGEL-LINI (Italy), Dr. W. COOK (USA), Prof. A. KORNHAUSER (Yugoslavia) (National Representatives); Dr. G. DONTSOV (UNESCO), Prof. M. J. FRAZER (FECS), Dr. D. WADDINGTON (UK), Dr. J. J. THOMPSON (UK) (Observers).

1. Composition of the Committee

The Committee received an up-to-date list of Members and National Representatives but it was reported that Dr. H. HELLMAN had resigned as a Member. The Chairman indicated that appointment to Membership of the Committee was a matter for IUPAC but that he would make suggestions for a replacement in due course to the Executive Committee of IUPAC. Membership, it was pointed out, was not based on country nomination. The Chairman reported, with sadness, the death of Prof. SUBBA RAO, National Representative, India.

2. Minutes of Previous Meeting and Matters Arising

Minutes of the previous meeting of the Committee held in Madrid on 4 - 5 September 1975 (see *Comptes Rendus 28th Conference: Part B*, pp. 121 - 126) were approved.

- (i) It was reported that details of the recommendations of the Wrocław Conference (1973) had been published in chemical education journals in Canada, Italy and Yugoslavia.
- (ii) The report of the Laboratory Workshop held in Seoul, Korea in August 1975 had been presented to UNESCO and would be published in due course by the Korean Chemical Society. A similar Workshop, under UNESCO auspices, had been held in Jordan in February 1976 and another one was planned for 1977 in Mexico.
- (iii) The Chairman referred to the recommendations for a survey of chemical education in developing countries and suggested that this should be discussed as a substantive item on the agenda for this meeting (see item 12).

(iv) Several National Representatives reported that copies of 'Table of Atomic Weights to Four Significant Figures' had been sent to journals and publishers of textbooks for information and reproduction.

(v) The Chairman reported that an article, prepared jointly by himself and the Chairman of the Commission on Teaching of Clinical Chemistry Section, had appeared in *International Newsletter on Chemical Education*, No. 4 (June 1976). There was nothing further to report on the Working Party for production of some curriculum materials.

(vi) The Committee expressed their appreciation to the Chairman for the *Proceedings of the Symposium on Educational Technology in the Teaching of Chemistry* held in Madrid in September 1975 and particularly of the speed with which the *Proceedings* had appeared. Reference was made to the distribution of the Report and its availability from the IUPAC Secretariat in Oxford.

3. International Newsletter on Chemical Education

A report was received on the distribution of the *Newsletter* to date. It was suggested that some National Representatives could usefully distribute more copies and it was agreed that a questionnaire should be compiled to solicit information on this point.

The introduction of a section on chemical education research was generally welcomed. Prof. M. FRAZER, who volunteered at the Madrid Meeting to compile this section, reported that he had not received many replies to the invitation for comments on this feature but those he had received were wholly favourable.

It was noted, with satisfaction, that a recently signed contract with UNESCO would provide financial support for the two further issues (Nos. 7 & 8). Dr. DONTSOV (UNESCO) reported that a budget for US-\$3300 for supporting the *Newsletter* in biennium, 1977 - 78, had been included, but that this would be subject to approval along with all the other items in the budget at the General Conference of Member States of UNESCO in November 1976.

4. Federation of European Chemical Societies (FECS)

An oral report was received from Dr. U. HOFACKER and Prof. A. KORNHAUSER on the recent meeting of the Working Party on Chemical Education for FECS held in Dublin, Ireland, in April 1976. They referred to three current areas of activity: (a) Chemistry for the

general public; (b) Olympic contests for chemistry students; (c) Chemistry at University level for non-chemists. The National Representative in Ireland of the IUPAC Committee on the Teaching of Chemistry (Mr. P. START) attended the meeting as an observer for IUPAC.

Prof. M. FRAZER gave a report on the 'Survey of Chemical Education in Europe' which had been in preparation for some time. The Survey was at the printing stage and should be available as a printed report at the end of 1976.

The Committee were pleased to receive these reports and expressed the view that the Survey of Chemical Education in Europe and the activities in Chemistry for the General Public would be of value and relevance in the proposed International Conference on Chemical Education to be held in 1977 (See item 9).

5. ICSU Committee on the Teaching of Science (ICSU CTS)

The Secretary reported briefly on the recent meeting of the ICSU CTS held in London in May 1976 referring specifically to proposals for an International Conference on Integrated Science to be held in the Netherlands in 1978 and the expanding activities of the new-established International Council of Associations for Science Education (ICASE).

6. Continuing Education in Industry

Dr. W. COOK, Convenor Working Group for this project, reported that after an unfortunate delay in establishing the Group he had now distributed letters and a draft questionnaire to the Members. So far he had had only one response.

Some Members of the Committee expressed reservations about using a specific questionnaire to conduct a Survey of Continuing Education and preferred a general letter. Others agreed that an industrial psychologist would be helpful in designing a suitable letter/questionnaire to elicit the information desired.

Prof. FRAZER reported on a proposed UNESCO-sponsored study of industry/university cooperation in chemistry to be conducted by FECS which would probably concentrate on the following areas: Student experience in industry, student visits to industry, appointment of staff from industry, industrial experience for University staff, consultancies, post experience continuing education, University staff

teaching in industry, joint research projects, liaison centres and liaison officers and general communications.

Dr. COOK agreed to take note of all these comments and discussion points and to proceed as quickly as possible to begin the Survey using National Representatives and the International Company Associates Group for local support.

7. ALECSO Regional Meeting on Chemical Education

Proposals for a regional Seminar on Chemical Education to be held in Egypt under the auspices of ALECSO were discussed in the light of the contract between UNESCO and IUPAC for assistance from the IUPAC Committee on the Teaching of Chemistry in the Seminar.

The Seminar would consist of 10 topics with a paper and discussion on each. The proposed topics were: (a) Principal problems of teaching chemistry in schools in the Arab region; (b) Trends in the teaching of chemistry; (c) Study of the teaching of chemistry in schools in the Arab region; (d) Methods and modern approaches of chemical education; (e) Relationship between chemistry and economic development; (f) Chemistry and the environment; (g) Problems of training chemistry teachers; (h) Low cost equipment for chemistry teaching; (i) Texts for teaching chemistry; (j) Out of school activities. Of these it was proposed that (b), (d), (e) and (f) should be prepared by consultants outside the Arab region, i.e. through IUPAC with the UNESCO contract. The others would be presented by chemical educators from the Arab region through ALECSO.

One of the four papers—that on trends in chemical education—would be prepared by Prof. FRAZER under a separate contract with UNESCO. Dr. D. WADDINGTON agreed to coordinate the preparation of the other three papers and himself to prepare the paper on methods and approaches in chemical education. It was also agreed that the National Representative for Egypt (Dr. SADEK) should assist with the local arrangements as far as IUPAC involvement was concerned.

The dates of the Seminar were to be in October but it seemed from the latest report received by Dr. DONTSOV that the Seminar would now be held before 20 November or, more likely, in early December. About 40 participants were expected. The Committee endorsed the involvement of IUPAC in this Seminar and specifically of Dr. WADDINGTON as the convenor of the IUPAC sponsored papers.

8. Anthology of Chemical Education Articles

There was a full discussion on this project for which IUPAC had signed a contract with UNESCO. Among the points mentioned were the following: (a) that the anthology should be aimed at secondary school level, particularly at teachers of chemistry; (b) that the articles selected should reflect the relevance of chemistry to society and to other subjects; (c) that the publication should be available in both English and French and that translation into other languages should be encouraged locally, and also a version should be made available eventually in Spanish; (d) that the articles should reflect chemistry as a subject as well as chemical education, but the chemistry level should not be too high.

It was agreed that the overall aim of the publication should be the improvement in the teaching of chemistry at the secondary level, particularly in developing countries. The two editors appointed for the project—Dr. J. J. THOMPSON (UK) and Prof. M. LAFFITTE (France)—outlined their own views on the anthology and their intention to review chemical education journals, probably by means of a questionnaire to the editors of such journals worldwide. The anthology would probably contain 200-300 pages (25-30 articles) and would appear in both English and French. The distribution of the publication, which initially would be limited to 3,000 copies, was also discussed particularly with a view to ensuring that copies reached key teachers in the countries concerned. The use of science teachers' associations in this respect was mentioned.

The editors agreed to proceed now with the task of identifying articles and authors from the literature and to submit their suggestions to the Committee for information, and to UNESCO (through the IUPAC Secretariat) in fulfilment of part of the contract. The publication itself would appear in the 1977 - 78 biennium.

9. International Conference: 1977

The Chairman reported that an invitation had been received from Yugoslavia to hold the proposed Conference in 1977 in that country. The Committee were pleased to receive this information and agreed to recommend that the invitation should be accepted. There was a long and full discussion on the structure and content of the Conference. This was reported separately as a conference-planning report for the Conference Committee and for UNESCO (under contract number 216.609) based on the deliberations of a Working Party (Prof. M. J.

FRAZER, Dr. U. HOFACKER, Prof. A. KORNHAUSER, Dr. D. WADDINGTON) and the views of the whole meeting.

It was agreed that there should be an international organizing committee for the Conference as follows: Prof. C. N. R. RAO (Chairman), Mr. D. G. CHISMAN (Convenor), Prof. I. BEREZIN, Dr. W. B. COOK, Prof. G. S. HAMMOND, Prof. M. LAFFITTE, Prof. A. KORNHAUSER, Dr. G. DONTSOV (UNESCO), Prof. M. FRAZER, Prof. U. HOFACKER, Prof. G. ILLUMINATI, Prof. B. NEWBOLD, Prof. D. VITOROVIC, Prof. A. GUERRERO, Prof. B. JEZOWSKA-TRZEBIATOWSKA, Dr. H. SADEK, Dr. D. WADDINGTON. They would work mainly through correspondence.

It was also agreed that the Convenor (and the Chairman, if possible in relation to other travel commitments) should meet the local Yugoslav organizing committee in Ljubljana in September 1976 to agree the details for the first circular and to see the physical facilities for the Conference. A further opportunity for the Chairman and Convenor to meet in Yugoslavia might occur in January 1977 if proposed travel plans for other purposes materialize.

The first circular should be available for distribution in October 1976 and an estimated 4,000 copies would be required. Invitations to key speakers should be issued in September/October 1976 by the Chairman. The second circular should be available by January or February 1977 with final registrations by 30 June 1977. Papers from the principal speakers should be requested for end of March 1977.

The anticipated financial support for the Conference would be made up as follows (all figures are in US-dollars): (a) UNESCO*—4000 for preparative work in 1977; 12,000 for participants (author and key speakers); 4000 for conference services; 3000 for preparation of final report; 3000 for staff travel and miscellaneous. (b) FECS—4000 for FECS participation. (c) IUPAC—5000 to be requested for general support; 5000 for Committee Members. (d) Yugoslavia—General support, printing, secretarial services, meeting rooms, local hospitality, etc.

10. Monographs on 'Chemistry for People'

The Committee considered a letter from the Secretary General of IUPAC (Prof. G. OURISSON) suggesting the involvement of the Committee in the preparation of monographs for farmers (explaining the basic chemistry of pesticides, herbicides, etc.) and for similar

*Subject to approval of 1977 - 78 UNESCO Budget by UNESCO General Conference Meeting in October/November 1976.

groups of people to explain the impact of chemistry and applied chemistry on their lives. The Committee agreed with the importance of this type of booklet and that IUPAC should be seen to be involved in this form of general public relations. It was suggested, however, that first of all the National Representatives should be asked to report on what already existed in their respective countries, either in printed form or as TV programmes, etc.

11. Chemistry as a Human Activity

Copies of a proposed syllabus at senior secondary level on 'Chemistry as a Human Activity' submitted by Dr. B. M. PRESTT (UK) were distributed for information. It was agreed that this type of development of social relevance of chemistry was important and should be monitored particularly with respect to the forthcoming International Conference in 1977.

12. Survey of Chemistry in Developing Countries

The Chairman suggested that the Committee should follow up one of the recommendations of the Wrocław Conference (1973) by undertaking a modest review of chemistry in developing countries. He offered to initiate the Survey himself and anticipated that a small grant (\$750) would be required to cover essential expenses. The Secretary agreed that the facilities and resources of the British Council with professional science education staff in many developing countries would be available to assist in the compilation of data.

13. Date and Place of Next Meeting

The officers would need to meet in Yugoslavia within the 1976 - 77 session to complete the arrangements for the 1977 Conference. The Committee would meet in Yugoslavia in September 1977 at the time of the International Conference.

COMMISSION ON POLYMER CHARACTERIZATION AND PROPERTIES (IV.2)

Antony, 2 July 1976

Present: Dr. J. W. BARRETT (Chairman), Prof. H. BENOIT (Acting Chairman of Working Party on Molecular Characterization of Commercial Polymers), Dr. P. L. CLEGG (Chairman of Working

Party on Structure and Properties of Commercial Polymers), Mr. P. H. FINK-JENSEN (Chairman of Working Party on Supported Polymer Films), Dr. J. H. SAUNDERS (Co-opted Member), Dr. H. WILSKI (Chairman of Working Party on Thermodynamic Properties of Polymers), Dr. A. J. de VRIES (Acting Secretary).

1. Terms of Reference and Composition of Commission

It was agreed that the letter of 25 August 1973 from the Macromolecular Division to the IUPAC Bureau essentially charged the Commission with (i) Co-ordination of activities of present Working Parties; (ii) Creation and control of new Working Parties covering specific topics in the general field of characterization and properties of industrially important polymers.

It was noted that the Titular membership of the Commission will be limited to six in the first place, made up of the Chairmen of the Working Parties and others nominated by the Division Committee. One more Titular Member will result from the appointment of a Chairman for the Working Party on Molecular Characterization of Commercial Polymers.

2. Reports from Working Parties

Working Party on Structure and Properties of Commercial Polymers

Dr. CLEGG had recently taken over the Chairmanship of this Working Party from Dr. de VRIES and presented the written summary report of the Working Party. Since the report had been prepared, there had been a meeting of the Working Party and Dr. CLEGG was able to add to the written report the following points: (i) The co-operative programme on melt rheology and structure of SBS block copolymers was progressing but there might be good reason for inviting the Working Party on Molecular Characterization to initiate studies on molecular characterization of these block copolymers. (ii) Final reports on the programmes on 'Orientation in Polymers—Rubber Modified Polystyrene' and 'Mechanical Properties of Rigid PVC' would be available at the next meeting of the Working Party. (iii) There would be two new collaborative programmes, both using polypropylene but from different suppliers. The first programme would use polypropylene supplied by Montedison for impact strength testing, whilst the second programme would be using Rhone Poulenc polypropylene film and would extend the collaborative studies of the effect of molecular orientation on mechanical properties.

Working Party on Molecular Characterization of Commercial Polymers

Prof. BENOIT summarized the activities to date of the Working Party and reported that the study of low-density polyethylené (LDPE) molecular characterization was in its final stage and had taken some five years. The first wide distribution of the LDPE samples had led to results from various laboratories with very high degree of variance. Subsequent work had reduced these differences to acceptable values but there was very clear evidence that the discrepancies originally found, and perhaps likely to reoccur unless correcting measures were taken, were due largely to use of wrong samples for calibration. The Working Party had agreed to move to a new collaborative programme using polypropylene supplied by Dutch State Mines.

Prof. BENOIT proposed Dr. Th. G. SCHOLTE of Dutch State Mines as the new Chairman and the Commission was unanimous in its approval and recommended Dr. SCHOLTE to be confirmed in this office by the Division Committee.

Working Party on Supported Polymer Films

Mr. FINK-JENSEN made available a summary of the activities of this Working Party and a copy of the report of its last meeting on 11 - 12 March 1976. In his review of the past activities of this Working Party (previously a Section of the Applied Chemistry Division) Mr. FINK-JENSEN stated that of about 24 members of the Working Party, some 50% were from industry and some 50% from university and institutes, that many reports had been made available to specific journals and that as an example there would be a new report issued in August on the analysis of polyamides. There had been continuing close contact with ISO and from time to time recommendations to ISO had been made arising from the collaborative work of the Working Party.

Mr. FINK-JENSEN emphasized that specific work plans were being developed by individual members of the Working Party for collaborative programmes in: (i) Solvent - polymer interaction, (ii) Adhesion, (iii) Analysis of functional groups in amino resins. The suggested programme for amino resins would be given a wide circulation within IUPAC and industry before a collaborative programme was developed.

There was agreement that advantages might well result from a broader representation of industry in this Working Party and Prof. BENOIT and Dr. de VRIES would be examining opportunities for more French involvement.

The two 'information' projects of this Working Party were discussed and there was general recognition that these might well be appropriate as there seemed to be inadequate information services within the paint and related industries.

Working Party on Thermodynamic Properties of Polymers

This was a new Working Party and as yet had no collaborative programme but Dr. WILSKI was able to present a proposition for a project concerning glass transition temperature of polymers. He prefaced his introduction of this paper with some general remarks arising from preliminary discussions. He was not too happy with the title of the Working Party and further consideration was continuing with regard to a more appropriate title, perhaps including the words 'thermal properties' rather than 'thermodynamic properties'. It was evident that much of the work on thermal and thermodynamic properties of polymers had often been carried out with excellent usage of classical methods but had frequently neglected a study of the characterization of the polymer, thermal history of the polymer and the time element involved in property measurement. A thermal or thermodynamic function, independent of time as far as monomolecular species were concerned, was much time-dependent for polymers. These early considerations had led Dr. WILSKI to believe that there were many opportunities for collaborative work but that in the first place a specific property should be studied and the choice was for glass transition temperature. There was no exact definition of T_g and there were many methods for its determination. When 'thermal' methods were used (e.g. specific heat measurement), the time function became important and traces of monomer extremely significant. Enthalpy relaxation was very dependent on thermal history.

There was considerable support for this first limited programme and more collaborators, particularly from France and the UK were thought desirable. It was noted that the work would be done on polystyrene supplied by Hoechst, and Dr. WILSKI's attention was drawn to the very considerable work on T_g for polystyrene which had been included in the early programmes now published on polystyrene within the Working Party on the Structure and Properties of Commercial Polymers.

3. Co-ordination of Programmes of Working Parties

There was much active discussion both during the presentation of the separate reports of the Working Parties and afterwards concerning the possible interlocking of programmes and particularly on the de-

sirability of ensuring good molecular characterization of all samples which were being worked on in any Working Party.

Recommendations to Working Parties

The following recommendations were developed through the discussion of the on-going and possible future programmes of the Working Parties.

- (a) Each Working Party would pass to members of the Commission and Secretary of the Division copies of minutes, of final draft reports, and lists of projects added to their programmes.
- (b) Details of membership of each Working Party would be forwarded by it to the IUPAC Secretariat (Oxford) who had been asked to keep members of the Commission and the Secretary of the Division informed.
- (c) Each Working Party would inform the others on polymers to be investigated. Objective was to establish the use of the same polymers for all Working Party programmes as far as possible.
- (d) Where different samples of the same polymers were being investigated steps would be taken to establish comparative molecular characterization. A particular case was the starting of the three separate programmes on polypropylene in two Working Parties (Structures and Properties, and Molecular Characterization); it was agreed that each supplier of the samples would be asked to make comparative molecular characterization studies on all three.
- (e) It was desirable that all polymers under study in Working Parties should be investigated with respect to molecular characterization by the Molecular Characterization Working Party. A particular case was the SBS block copolymers supplied by Shell for the Working Party on Structure and Properties. This might well necessitate some change in membership of the Molecular Characterization Working Party but all were agreed that a dynamic membership of all Working Parties was desirable according to projects involved.
- (f) The membership of the Supported Polymer Film Working Party was apparently not sufficiently representative of industry for programmes such as those proposed for: (i) analysis of functional groups in amino resins; (ii) solvent - polymer interactive studies; (iii) measurement of adhesion.

The Commission therefore endorsed the proposed circularization throughout the Division of the proposals for the first two projects, but emphasized the need for these to be drawn up in specific

terms. It also recommended the seeking of broader industrial representation, particularly from companies who were supplying the polymers to the paint and related industries.

(g) The Supported Polymer Films Working Party had a project concerning collection of information on documentation centres and an on-going research project throughout the world was under investigation. The Commission agreed the need for proper information before commencement of any collaborative IUPAC programmes, suggested that these information projects should continue, but emphasized the size of the tasks to be done particularly with regard to making information timely and continuously updated.

(h) The Commission agreed with the proposals of the Chairman, Dr. WILSKI, of the Thermodynamic Properties Working Party for collaborative programmes on the determination of glass transition temperatures using 'thermal' measurements (e.g. specific heats, specific volume, DTA), and using other methods (e.g. torsion pendulum). As already 15 laboratories had agreed to participate, the Commission encouraged the early initiation of the programme and advised the Working Party to take note of the considerable work on T_g in polystyrene programmes, past and present, of the Structure and Properties Working Party.

(i) Calibration methods and suggestions for property molecular characterization by GPC, light scattering, etc. developed by the Molecular Characterization Working Party, would be summarized and passed to ISO. Other Working Parties to consider possibilities for similar actions.

4. New Working Parties

The suggestions for possible new Working Parties were discussed along with other possible topics. The general conclusion was reached that there should be no early initiation of new Working Parties particularly because the existing Working Parties were adding new projects to their programmes and members were learning how to ensure good inter-relationships between these programmes. However a short list of priority topics for further elaboration was developed as: (i) Combustion properties; (ii) Translocation of low molecular weights species in macromolecular systems; (iii) Surface properties of films and fibres; (iv) Thermal conductivity of polymers.

It was agreed that all members of the Commission and of the Divisional Committee should be invited to comment on and make suggestions for suitable participants in any or all of the topics and to elaborate on the possible technical programmes within each topic. There would be a return to this list at the next meeting in 1977 when one or more new Working Party might be decided on.

It was also agreed that there should be no separate Working Party on elastomers or on any other particular sector of macromolecules. Each Working Party was encouraged to take elastomers and all macromolecules into account.

5. Network Club

Prof. BENOIT summarized the position of the 'Network Club' and although the Commission was in favour of some IUPAC support of such clubs, it did not think that they fitted into the framework of Working Parties. It therefore would recommend to the Macromolecular Division that any IUPAC sponsorship should be found through some other means, for instance, through micro conferences.

6. Next Meeting

It was agreed that the next meeting should take place in Warsaw at the IUPAC General Assembly on one of the days 23rd, 24th, 25th or 26th August 1977. The Chairman had requested the Secretariat for a one-day meeting and would inform all members as soon as the specific day had been allocated.

J. W. BARRETT

APPLIED CHEMISTRY DIVISION COMMITTEE

Frankfurt, 8 - 9 July 1976

Present: Dr. H. EGAN (President), Prof. H. SUOMALAINEN (President-Elect), Dr. A. J. COLLINGS (Secretary), Dr. J. A. EPSTEIN, Dr. H. FREHSE, Dr. S. FREYSCHUSS, Dr. A. F. LANGLYKKE (also representing Commission on Fermentation), Dr. R. MARCUSE, Prof. D. REYMOND, Dr. W. G. STOLL. By invitation: Dr. E. O. HAENNI (representing Commission on Food Additives), Prof. C. PAQUOT (representing Commission on Oils & Fats), and Mr. J. OKSANEN (assisting Prof. SUOMALAINEN).

1. Minutes of Previous Meeting and Matters Arising

The minute of the meetings held in Madrid on 2, 5 and 7 September 1975 (see *Comptes Rendus 28th Conference: Part B*, pp. 293-296) were approved. Dr. EGAN reported that the changes to IUPAC Statutes and Bylaws which had been proposed, together with the individual extensions of Titular Membership in the Applied Chemistry Division, the additional Associate Members and National Representatives in the Oils & Fats Commission and the new Commission on Reclamation of Solid Wastes proposed by the Division, had been approved by Council in Madrid. Co-ordinating Committees for Food Chemistry (Chairman, Dr. R. MARCUSE) and Pesticide Chemistry (Chairman, Dr. H. FREHSE) had been established, the memberships of which were appointed by the Commissions concerned and would need to be appointed on a regular, one-or two-yearly basis. Membership details of the Co-ordinating Committees and of the Oils and Fats Commission Working Groups were recorded in *Comptes Rendus 28th Conference: Part A*. Guidelines for the appointment of members of Co-ordinating Committees were discussed and Dr. EGAN agreed to draft proposals for these for further consideration by the committees concerned.

2. Corresponding Members

A member of the Division Committee had been appointed as Corresponding Member for that Commission, and to help represent the view of the Commission in the Committee and generally to expedite liaison between the two bodies. This system showed promise and, subject to the availability of funds, Corresponding Members should where possible attend Commission meetings with the view to helping Commissions by more effectively making their problems known to the Division Committee and keeping the Committee informed on progress. Corresponding Members of the Committee were confirmed as follows: VI.1, VI.2 Prof. REYMOND; VI.3 Dr. LANGLYKKE; VI.4 Dr. MARCUSE; VI.5 Dr. COLLINGS; VI.6, VI.7 Dr. STOLL; VI.8 Dr. EPSTEIN; VI.9 Dr. FREYSCHUSS.

3. Membership

Dr. EGAN reminded the Committee that Prof. SUOMALAINEN was due to succeed him as President of the Division in 1977 and that Dr. EPSTEIN, Dr. LANGLYKKE and Dr. STOLL, together with Dr.

COLLINGS, were due then to retire from the Committee. Prof. SUOMALAINEN expressed the hope that Dr. MARCUSE would then become Secretary to the Division (and he proposed appointing Dr. LANGLYKKE as Vice-President). Dr. EGAN said that Prof. WAGNER had asked that Dr. P. H. SCHWEITZER (Federal Republic of Germany) and Dr. E. J. HAMILTON (UK) should be appointed new Titular Members of the Water Quality Committee, Dr. SCHWEITZER to act as Secretary to the Commission. The Committee was sympathetic to these proposals but felt able, in view of the lack of a full recent report of the programme of the Commission, only to support appointments to Associate Membership; and agreed accordingly. The Committee also considered the general geographic distribution of individual memberships of the Division.

It was agreed that the 1977 election of the Divisional Committee should be conducted by post and that nominations should be invited from all Titular and Associate Members of the Division to be received by Dr. COLLINGS not later than 28 February 1977. A postal ballot would be conducted if necessary in which event votes should be received by Dr. COLLINGS not later than 31 July 1977.

4. Commission on Air Quality

Dr. FREYSCHUSS reported that he had had discussions with Prof. PILZ and had corresponded with him but had had no recent report from him on progress in developing the Commission's new programme. Dr. EGAN said that earlier proposals from Prof. PILZ had shown promise and were acceptable both to the past Chairman of the Section on Clinical Chemistry, Dr. TONKS, and the present Chairman Prof. LOUS. The Committee considered that it was important to develop the programme and whilst regretting Prof. PILZ' inability to attend the present meeting agreed that a further letter should be sent calling for an early report, for consideration well in advance of the 29th General Assembly.

5. Reclamation of Solid Wastes

Dr. EGAN referred to the report received from Prof. PIRT which indicated that the new Commission had consulted various experts, considered reports, visited laboratories and attended meetings concerned with waste reclamation and had gained the general impression from this survey that problems have been identified either in very broad terms or at a very narrow detailed level. There was no need for

another large-scale symposium on the subject but a useful contribution could be made by an enlarged commission of experts who would present authoritative surveys and formulate conclusions and recommendations to stimulate action to solve the most pressing problems from a global point of view. This should meet in Warsaw in 1977, when the following topics were recommended for discussion: (i) World overview; (ii) Aerobic and anaerobic microbial digestion; (iii) High and low temperature pyrolysis with special reference to cellulose plastics and rubber; (iv) Chemical breakdown of cellulose and lignin; (v) Enzymatic breakdown with reference to cellulose; (vi) Domestic and commercial refuse—presorting, collection and pulverizing; (vii) Composting; (viii) Mining and metal wastes; (ix) Health and toxicological aspects; (x) Particular problems of developing countries.

Each member of the Commission would deliver a paper on one or more of these topics, all of which would be discussed by the whole Commission, which would then formulate conclusions and recommendations for action. The Committee endorsed these proposals and agreed to write to Prof. PIRT accordingly requesting budgetary and other details.

6. Divisional Programme

Dr. EGAN referred to the summary of the divisional programme circulated earlier and said that a similar document relating to all of the Divisions had recently been prepared by Presidents. It was agreed that Dr. COLLINGS should write to Commission Chairmen for up-dated information (with new project target dates where applicable) by 30 November 1976. The new document would also become the basis for discussions with the Analytical Chemistry Division in August 1977. Arrangements were in hand for the 5th International Fermentation Symposium (which had just taken place), the International Symposium on Advances in Smoking of Foods (Warsaw, 1976), the Third International Symposium on Mycotoxins (Paris, 1976), the Third International Symposium on the Genetics of Industrial Microorganisms (USA, 1978), the Fourth International Congress of Pesticide Chemistry (Zürich, 1978) and the Sixth International Fermentation Symposium (Canada, 1980). No progress had been reported in the Symposium on Microbiological Processes in Industrial Waste Water Treatment which was to have been held in Prague 18 - 20 January

1977 however; it was agreed to delete this from the programme and that Dr. FREYSCHUS should seek further information from Dr. GRAU.

The possibility of a new division on Health and Environment had been considered by Council in Madrid in 1975 but no action had been taken on this. Dr. EGAN expressed the view that all Divisions might find room for such aspects within their own programmes: these could be coordinated, as necessary, on the basis of the new documentation now available. A special meeting had been called to discuss these aspects further in Strasbourg in September 1976.

Dr. EPSTEIN reported on progress in the evaluation of Commissions' programme, referring to the revised Project Evaluation Form circulated to Members in May 1976. The present projects could be divided into three groups: those generally agreed to be worthwhile, those for which opinions on acceptability varied and those which were in general regarded as doubtful; and felt that the further attention of the Committee was most profitably directed to the middle group. Detailed consideration was given to the current programme based on the summary evaluation prepared by Dr. EGAN and circulated in advance; and it was agreed that the new programme to be prepared by 30 November 1977 (cf. first paragraph in this Section), should be evaluated on the basis of the 1976 form by the divisional Corresponding Members who would report to Dr. EPSTEIN by 28 February 1977. Dr. EPSTEIN would then compile a general report which could be available by 30 April for circulation to Members for further discussion in Warsaw in August 1977.

Dr. EGAN reported that he had further discussed the subject of Ocean Chemistry with Dr. J. W. BARRETT, convenor of the International Company Associates Group; and with the Secretary General of ICSU Scientific Committee on Oceanic Research SCOR, Mr. R. I. CURRIE. Programmes had been exchanged and it was hoped that Dr. COLLINGS could attend the Joint Oceanographic Assembly to be held in Edinburgh in September 1976 in order to ascertain problems of common interest and the possible basis for further diversification of the Division's programme.

Dr. EPSTEIN referred to his brief report, previously circulated, as 'Trivial Names for Chemicals in Trade and Industry'. The problem could be divided into three parts: (a) the identification of chemicals of interest and the various names used; (b) agreement regarding the choice of selected names for these; (c) encouraging the wide adoption by industry and commerce of the names selected.

A typical list had been prepared for inorganic chemicals and a broader basis was available in the British Standards Institution's 'Recommended Names for Chemicals Used in Industry'. Users should be encouraged to contribute further proposals on an international basis, preferably in at least three major languages and on this basis a small Commission on Applied Chemicals Nomenclature, to work in harmony with the Interdivisional Committee on Symbols and Nomenclature, might be proposed at the 29th General Assembly in 1977. Dr. EPSTEIN agreed to consider these matters further and report again to the Committee in Warsaw.

7. International Company Associates Group

Dr. EGAN reported that copies of the divisional programme had been sent to ICAG members. Dr. STOLL said that a questionnaire had been circulated concerning the 'image of chemistry' and a small sub-committee of IUPAC Bureau had been appointed to consider this further.

8. Chemical Research Applied to World Needs (CHEMRAWN)

Dr. EGAN recalled that whilst in Madrid in 1975 Council had agreed not to set up a new Division on Environment and Health following a separate initiative by the US Delegation the President had initiated discussions on the subject of Chemical Research Applied to World Needs (CHEMRAWN) and a special Planning Committee (of which he was a Member) appointed under the Chairmanship of Dr. B. W. ROSSITER to give further detailed consideration to the subject. Following a meeting of this committee in Ottawa, detailed proposals had now been made for a 'World Conference on Future Sources of Organic Raw Materials' to be held in Toronto 10 - 13 July 1978. The Committee would meet again in September 1976.

It had been proposed that the programme for the 1978 Conference should deal mainly with coal-based chemicals, forest products and other renewable resources, resource conservation and new materials and composites. It was agreed that Prof. PIRT should be invited to comment on resource conservation with special reference to solid wastes; and that attention should be drawn to current work of the Commission on Fermentation on the bio-conversion of cellulose, for which Prof. HUMPHREY might be prepared to organize suitable contributions. Other suggestions for consideration included technol-

ogy transfer for developing countries, water conservation and the chemistry of the oceans.

9. Analytical Chemistry

Dr. EGAN reminded the meeting of the special liaison arrangements with the Analytical Chemistry Division which had been made in view of the present interests in this area of the Applied Chemistry Division. In addition, Dr. D. B. TONKS, past Chairman of the Section on Clinical Chemistry, had been co-opted onto the Division Committee and Dr. EGAN had had the opportunity of confirming the general understanding on analytical aspects with the Section in discussions with the present Chairman, Prof. P. LOUS in Copenhagen on 9 June.

Proposals for a preliminary meeting to which sponsors of international collaborative analytical studies would be invited to discuss the general question of harmonization of principles had been further discussed with the Analytical Chemistry Division and both Prof. N. TANAKA and the President-elect Prof. T. S. WEST had agreed to the suggestion that a small meeting for 25 - 40 participants in 1977 or 1978 might, among other things, determine whether a larger open conference might be desirable later. Prof. FREISER had made tentative arrangements to accommodate such a meeting at the Pittsburgh Conference, to be held in Cleveland, Ohio 26 February - 1 March 1977. These proposals were endorsed, except that it was felt that in order to allow sufficient time for the arrangements necessary, the preliminary should not be held until towards the end of 1977 or early in 1978. Subject to the agreement of the Analytical Chemistry Division, it was agreed that proposals to Council should be made to this effect.

10. Divisional Guidelines

Prof. SUOMALAINEN said that he had given consideration to the subject of Divisional Rules for approval by Council. He had considered that a set of simple guidelines such as those circulated in advance of the meeting was to be preferred since these gave greater flexibility. Guidelines might include: (i) Nomination of Committee Members of meritorious Commission Members; (ii) Membership should have due regard to geographical distribution; (iii) Corresponding Members should be appointed for each Commission as at present; (iv) Co-opted Members should rank as Associate Members.

In addition it was useful to accord the President the privilege of nominating the Division Secretary, whilst some form of selection for

nomination for Commission Membership, having regard to industrial interests, was also desirable. These views were generally accepted and it was agreed that any further comments should be sent individually by members to Prof. SUOMALAINEN, with copy to Dr. COLLINGS, to reach them by 30 October 1976 following which a further draft would be prepared for consideration in 1977.

11. Matters Raised by Commissions

In response to a request received from Dr. KOJIMA it was agreed that Commissions through their Chairmen should be free to appoint Vice-chairmen from their Titular Membership if this was found to be a useful procedure. Dr. LANGLYKKE raised the question of special funding for individual projects: this could only be done with the knowledge and agreement of IUPAC Treasurer since funds given for individual projects might otherwise compete with funds from the same source contributed direct to IUPAC.

Prof. PAQUOT reported that the Commission on Oils and Fats wished to change its name to the Commission on Oils, Fats and Derivatives. This was noted and would be communicated to the Secretariat for approval. Dr. MARCUSE reported that discussions were in progress concerning the names of the two Food Commissions.

In response to Dr. EGAN's request for discussion on special difficulties, the question of removal of inactive Titular or Associate Members was raised. It was agreed that this should be referred to the Bureau.

12. Finance

Dr. EGAN thanked members of the Committee and Chairmen of Commissions for their co-operation in helping to manage the Divisions financial resources and described how the total budget had been allocated. Expenditure on postage and stationery in particular had risen sharply in recent years and difficulties had also arisen because the savings normally expected had not this year been realised. It was suggested that it might be possible in a non-assembly year for the Division and all (or most) of the Commissions to meet together, thus affording a better opportunity for arranging group travels. It was however realised that Commissions also met in conjunction with major conferences or symposia which they had organized. It was also sug-

gested that a specific conference surcharge might be imposed in addition to the registration fee.

13. Next Meeting

The next meeting of the Committee would be held on the occasion of IUPAC 29th General Assembly in Warsaw, 12 - 21 August 1977.

COMMISSION ON MEDICINAL CHEMISTRY (III.4)

Paris, 19 July 1976

Present: Prof. E. J. ARIËNS (Chairman), Dr. J. F. CAVALLA, Dr. L. G. HUMBER, Prof. E. MUTSCHLER, Dr. M. PROTIVA, Prof. S. SAREL, Dr. J. THUILLIER (Titular Members); Prof. R. DAHLBOM, Prof. J. MATHIEU, Prof. W. Th. NAUTA (Associate Members). Prof. ALBERT, Prof. COMBET-FARNOUX, Dr. LUND-JENSEN, Dr. REKKER (Observers).

1. Minutes of Previous Meeting

The minutes of the last meeting held in Madrid on 4 - 5 September 1975 (see *Comptes Rendus 28th Conference: Part B*, pp. 227 - 233) were read and approved. The Chairman reported on the election of Dr. CAVALLA, Prof. MUTSCHLER and Prof. SAREL as Titular Members of the Commission and of Prof. DAHLBOM, Dr. HOULIHAN, Dr. KOHBAYASHI, Prof. MARINI-BETTOLO, Dr. MATHIEU, Prof. NAUTA and Dr. TOLDY as Associate Members.

2. Reports of Committees

Long Range Planning Committee (Dr. CAVALLA, Chairman)

Details of the points before the Long Range Planning Committee—essentially those reported in the minutes of the last meeting—were reconsidered. To these was added a suggestion from the Chairman of the need for consideration to be given to the question of tropical disease research. In his report the point was made that the Xth International Congress of Chemotherapy was due to be held in Zürich in September 1977, and that this could provide a forum in which the topic could be discussed. Prof. MUTSCHLER agreed to inquire of

colleagues in the German Chemical Society about the possibility of arranging a special meeting on tropical disease in Germany. The topic would also be kept on the agenda of the EFMC for consideration when International Symposia were being organized.

Prof. SAREL requested attention be given by the Long Range Planning Committee to the question of nomenclature in Medicinal Chemistry. It was recognized by the Commission that this was a subject of some complexity involving disciplines outside the purely chemical. After discussion, it was agreed that this matter be considered again at the next meeting, with the possibility of setting up a subcommittee devoted to the task. Meanwhile, Prof. SAREL was requested to define in detail his proposals for resolution and circulate them to the officers of the Commission. He would also act with Prof. MUTSCHLER to determine how best the matter should proceed, possibly effecting liaison with IUPHAR, IUB and FIP.

Attention was drawn to a suggestion from Prof. CAMPAIGNE that the CHEMRAWN program of IUPAC be applied specifically to medicinal chemistry.

It was agreed that, while the Long Range Planning Committee could not deal positively with its agenda items in that it met only within the Commission itself, a purpose was served by having the Committee in existence to alert the Commission of future needs.

Education Committee (Prof. NAUTA, Chairman)

Prof. NAUTA reported he had circulated interested parties enquiring what revision and updating was necessary for the Smismman Report on the Teaching of Medicinal Chemistry. This was only the first step in what would be a lengthy procedure.

3. Division of Health and Environmental Chemistry

The Chairman reported on discussions he had had with the IUPAC Secretariat concerning the setting up of a new Division of Health and Environmental Chemistry. It was intended that this Division should cover many items now within the orbit of the Applied Chemistry Division. It was recognized by the members of the Commission that this was a valuable initiative, although concern was expressed that this Commission might lose identity if absorbed by a larger body. It was pointed out, however, that no decision would be required from the Commission until a formal proposal was made. To achieve this end, Prof. ARIENS had agreed to attend a meeting in Strasbourg in Sep-

tember 1976 of interested parties within IUPAC. He would report back to the Commission at its next meeting.

4. Working Group on QSAR

Dr. REKKER reported on the progress made by QSAR group which had now reached the stage where formal international cooperation could be achieved. The Commission welcomed the initiative taken by Dr. REKKER and recommended the setting up of an international Working Party composed of Dr. REKKER (Chairman), Prof. MUTSCHLER, Prof. PURCELL, either Prof. HANSCH or Dr. TOPLISS, along with either Dr. TUTE or Dr. GAMELLIN. It was agreed that this Working Party would maintain close liaison with the Commission. It would not limit itself to regression analysis but would also consider other means of structure identification such as X-ray diffraction.

5. Reports and Publications

Distribution of Report on 'Predicted Compounds'

The 'Predicted Compounds' report had appeared in *IUPAC Information Bulletin* No. 49 (March 1975), pp. 12 - 15. The Chairman proposed that this be circulated again to correspondents to enable the widest distribution to be made. The report had been announced in the *Journal of Pharmaceutical Sciences* and published in the *European Journal of Medicinal Chemistry*.

Newsletter

The Chairman reported that Dr. RACHLIN was willing to continue his work in compiling the Newsletter. He requested all correspondents and the members of the Commission to advise Dr. RACHLIN of any news or items of interest.

Directory of 'Medicinal Chemistry Institutions'

Discussion was made of the proposed Directory of Medicinal Chemistry Institutions. It was pointed out that these may be difficult to define exactly and compiling an international list would be most time-consuming. It was agreed the matter be discussed again at a later date.

6. Liaison with IUB

Prof. MUTSCHLER reported on discussions he had had with IUB representatives. These suggested that any liaison would be welcomed

on all sides. It was recommended by the Commission that these discussions continue and that efforts be made to involve the IUB in the design of future symposia.

7. Correspondents

The Chairman reported that the number of correspondents was lengthening, the latest being those from Brazil and Mexico. In Spain, Dr. MADRONERO, or a designee, would replace Prof. GARCIA-MUNOZ. For Greece, Dr. HUMBER had proposed Prof. GEORGIADIS and Dr. RACHLIN had followed up this suggestion. Prof. NAUTA stressed that need for the list of correspondents held by the Commission be harmonized into that held by the E.F.M.C. He also appealed that any non-working correspondents be removed.

8. Reports on Commission-Sponsored Activities

Symposium on Drug Action at the Molecular Level (Joint with IUPHAR)

This Symposium was held in London on 12 - 13 April 1976. There were 14 speakers and the attendance was approx. 300. The proceedings would be published by Macmillan (London). Dr. CAVALLA would send a report to the Secretary Dr. RACHLIN.

IUPAC-IUPHAR-FIP Symposium on Biological Activity and Molecular Structure

Prof. NAUTA reported that the first circular for this meeting (to be held in Noordwijkerhout, The Netherlands: 30 August - 1 September 1977) had been published and had attracted much attention. The programme was now being finalized. The Chairman pointed out that since IUPHAR was jointly organized it might be advisable for the programme to be somewhat biologically orientated.

VIIth International Symposium on Medicinal Chemistry

Dr. CAVALLA reported that the first circular for this symposium (to be held in Brighton, UK: 4 - 7 September 1978) had just been issued and was being given to delegates to the Paris meeting. All matters were well in hand.

Summer School on Medicinal Chemistry

Dr. CAVALLA reported on the difficulties experienced in arranging the Summer School on the Teaching of Medicinal Chemistry (UK:

1978). He explained how the Continuing Education Committee of the Chemical Society had accepted the task but, when a grant had not proved available to bring participants from the underdeveloped areas of the world, had changed the emphasis away from the Teaching of Medicinal Chemistry toward Medicinal Chemistry and, as a result, presented a program far more complex and advanced than that which the Commission had originally proposed. While it was agreed that the Commission would give help to the Summer School of the Chemical Society by providing publicity, it could not be associated with it in any direct sense. It was felt that it lacked the necessary international element as well as that concerned with teaching. Finally, the Commission requested the Chemical Society to refrain from holding the Summer School alongside the VIth International Symposium at Brighton in UK in 1978. Dr. REKKER told the Commission of plans now well advanced to hold a Summer School in Clermont-Ferrand in September 1976. This would accommodate 20 to 25 students and be concerned uniquely with QSAR matters. If this school was a success, Dr. REKKER would propose to repeat it in 1978 with a larger attendance. The Commission requested that Dr. REKKER liaise with Prof. MATHIESON in the hope that a more international approach could be effected.

VIIth International Symposium on Medicinal Chemistry

Dr. THUILLIER reported that Spain had volunteered (Dr. MADRONERO) to be hosts for the 1980 VIIth International Symposium. Prof. NAUTA would follow this up and determine the capacity in Spain for this sizable undertaking to be accomplished satisfactorily. On the basis of his findings, a decision would be taken.

Meetings in North America

Dr. HUMBER stated that there would definitely be a joint Canadian - US meeting on Medicinal Chemistry in Eastern Canada in June/July 1982. He requested consideration be given to the idea of this meeting being made the VIIIth International Symposium of the EFMC. The Commission discussed this, but without resolution, since the matter was strictly one for the EFMC to decide. Dr. THUILLIER supported the idea but Prof. NAUTA felt that attendance by Europeans would be limited if the meeting were to be held in Canada. It was agreed to leave this matter in the hands of EFMC to determine, bearing in mind that Israel was also a possible venue for the 1982 and for the 1980 meeting as well.

9. Miscellaneous Matters

Tribute to Prof. GARCIA-MUNOZ

The Chairman paid tribute to Prof. GARCIA-MUNOZ, who was Commission's correspondent in Spain until his recent death. The Commission joined the Chairman in sending condolences to the family of Prof. GARCIA-MUNOZ.

Plans for Election in 1977

The Chairman pointed out that the Commission would need three new Titular Members in 1977 as well as a full slate of Associate Members. He requested nominations from the Commission members. At the same time the Chairman outlined the proposals of the Officers of the Commission for the Chairman and Secretary, who would have to take over for himself and Dr. RACHLIN in 1977. The proposal was that Dr. CAVALLA would become Chairman and Prof. NAUTA, Secretary. These proposals would have to be approved both by the Titular Members of the Commission and by the IUPAC Secretariat. He requested other nominations if any be made. Meanwhile, the Chairman requested serious thought be given to overlapping the terms of tenure of Chairman and Secretary in such a way as to allow continuity of major office holders and consequent experience being retained.

Next Meeting

The next meeting will be held in Warsaw in August 1977 during the 29th IUPAC General Assembly.

J. CAVALLA

INTERDIVISIONAL COMMITTEE ON NOMENCLATURE AND SYMBOLS (IDCNS)

Oxford, 16 - 18 September 1976

Present: Dr. K. L. LOENING (Chairman), Prof. N. LOZAC'H (Vice-Chairman), Dr. M. A. PAUL (Secretary), Dr. R. DYBKAER, Prof. W. C. FERNELIUS, Prof. O. HOFFMANN-OSTENHOF (Representing IUB), Mr. S. P. KLESNEY, Dr. D. R. LIDE, Jr., Prof. M. L. McGLASHAN, Prof. J. RIGAUDY, Dr. W. RING (18 September only), Prof. O. SAMUELSON (17 - 18 September), Prof. D. H. WHIFFEN. In attendance: Mr. P. D. GUJRAL, Miss A. TROUGHTON (IUPAC Secretariat) (in part).

1. Administration of IDCNS

The membership and Standing Orders of IDCNS as approved by the Executive Committee of IUPAC were reviewed, as was the Secretary's Report of Status and Activities to 30 June 1976, which had been sent to all members of IDCNS on 29 July. It was agreed that members representing organizations outside IUPAC were entitled to full discussion and voting rights on scientific matters, although IUPAC did not assume responsibility for their travelling expenses.

A list of current IUPAC projects involving considerations of nomenclature and/or symbols was distributed. This list had been abstracted from a more general list of IUPAC projects prepared by Miss TROUGHTON from information requested of the Division Presidents. Questions arose as to the actual state of progress on the various projects and on any draft documents that were complete or were nearing completion.

Prof. HOFFMANN-OSTENHOF described a scheme used by the joint IUPAC - IUB Commission on Biochemical Nomenclature (CBN) for classifying documents. Class I, II, III, or IV designated the stage of progress and the corresponding distribution. Only Class IV documents were final drafts, ready for publication and general distribution as Union recommendations. After some discussion of details, a consensus was reached that such a scheme had great merit for classifying nomenclature and symbols documents prepared by the various working groups in IUPAC, particularly to indicate stages at which involvement of IDCNS would be most helpful and expeditious. A description of the proposed scheme was worked out at the meeting. It would be sent to the Division Presidents for their comment, as a procedure recommended by IDCNS for the classification of draft reports. The appropriate class (I, II, III, or IV) was to be indicated on the manuscript, along with the date. Class II documents involving recommendations on nomenclature or symbols should be seen by IDCNS for early comment to the working party; in some instances, individual members of IDCNS could be helpful and be consulted even earlier, during the drafting of Class I documents. IDCNS should formally review all Class III documents falling within its Terms of Reference, to prepare recommendations to the Bureau/Council on publication by IUPAC. Among its advantages, the classification scheme should reduce premature attribution to IUPAC of documents that had not gone through the proper course of review and approval for publication. The classification scheme is used informally, hereafter in these

Minutes, in referring to various IUPAC documents under discussion.

It was agreed that the procedure that had been followed by the Officers of IDCNS, outlined in the Report of Status and Activities to 30 June 1976, for handling documents referred to IUPAC for comment was satisfactory. All members of IDCNS were to receive notice periodically of such documents by title, with opportunity to request copies from the IUPAC Secretariat and to comment on them. Ordinarily, the Officers would assign documents for detailed review to a few individuals selected for their special competence (and possibly including other specialists besides IDCNS members). Only those documents that appeared to call for full discussion, before agreement on a recommendation to the Bureau/Council could be reached, would be held over for consideration at a meeting of IDCNS.

2. Review of Nomenclature Activities in Progress

IUPAC Activities

Various members present were called upon to describe nomenclature activities and concerns of their respective Divisions or Sections of IUPAC. The list of current projects was used as a guide to the discussion.

Prof. WHIFFEN and Dr. LIDE spoke of a document before IDCNS entitled 'Initialled Abbreviations in the Chemical Literature', prepared by Commission I.5 (Molecular Structure and Spectroscopy) and approved for publication as a provisional recommendation ('Yellow' Appendix to the IUPAC *Information Bulletin*) by Division I (Physical Chemistry). IDCNS concurred in a recommendation to the Bureau that this document be published, with minor typographical correction, but with a change to a more appropriate title, 'Initialled Abbreviations in the Chemical Literature as Exemplified by Spectroscopic Terms'. The Committee felt that the first part of this report, outlining criteria for accepting or rejecting a proposed initialled abbreviation, was of general applicability to other fields besides spectroscopy (as Commission I.5 intended), and proposed to prepare a document along similar but more general lines, covering symbols used for terminology as well as initialled abbreviations. Symbols and initialled abbreviations would be assigned to one of the three categories: *approved*, *recommended*, or *not recommended*, according to guidelines implicit in stated criteria. Dr. DYBKAER, Prof. HOFFMAN-OSTENHOF, and Dr. LIDE were designated as a working party to

draft such a document for future consideration by IDCNS.* When a document satisfactory to IDCNS had been prepared, it would be distributed to the Division Presidents for comment, with the intention that it be ultimately published as an IUPAC recommendation. IDCNS expected that groups working on nomenclature in other chemical fields might be moved to develop extended lists of approved, recommended, and not recommended abbreviations, by adapting the criteria so proposed. A letter had been addressed to Commission I.5 informing its members of IDCNS's intention and acknowledging their initiative in undertaking such a practical solution to a troublesome problem.

Prof. FERNELIUS spoke on the concern of Commission II.1 (Atomic Weights) over the problem of variability (natural and man-made) in the isotopic distributions of many of the chemical elements, and the possible need for corresponding labelling of analytical reference standards. The Commission brought the matter up for discussion with other concerned groups at the 1975 IUPAC Conference. A document was being drafted, outlining the problem and enlarging on its implications for the presentation and use of the Table of Atomic Weights.

Prof. FERNELIUS commented also on the problem of names for the chemical elements, one of the few areas of chemistry where trivial names prevail. After some discussion of nomenclature problems (including indexing) created by recently announced discoveries, confirmed and unconfirmed, of numerous elements of high atomic number, the following recommendation was approved:

Where names for the chemical elements had not been established, IDCNS recommended that a scheme for names and symbols based on atomic number be used, such as the one devised by IUPAC Commission II.2 (Nomenclature of Inorganic Chemistry, CNIC), and reported in *Comptes Rendus 27th IUPAC Conference: Munich, 1973*.

Prof. LOZAC'H reported that minor revision was in progress by Commission III.1 (Nomenclature of Organic Chemistry CNOC) on Sections A, B, C, and D of *Nomenclature of Organic Chemistry* (IUPAC's 'Blue' book). Section E: "Stereochemistry", covering fundamental nomenclature in its field, was published in *Pure and Applied Chemistry* in 1976. A second part was planned but had not yet been started, covering a variety of special topics (configuration vs.

*Such a draft document was distributed to Committee Members on 23 September 1976 by Dr. LIDE, with a request that comments be sent to Prof. HOFFMANN-OSTENHOF.

conformation, axial and planar chirality, pseudoasymmetry, general treatment of exo- and endo-isomerism, etc.). Prof. W. KLYNE was expected to lead this project. Also under discussion was a proposed Section G on general rules for building chemical names.

A first document on 'Natural Products and Related Compounds' had been completed and was available for publication (since published as a Provisional Nomenclature Appendix No. 53: December 1976). This presented general background. CBN was expected to deal with specific areas of biochemical interest. The entire project would constitute Section F of *Nomenclature of Organic Chemistry*. A manuscript on nomenclature for isotopically modified compounds was nearing completion, subject only to limited editorial changes suggested by Dr. W. E. COHN (Secretary of CBN). It had been approved for publication by Division III (Organic Chemistry) and would go essentially as a Class III document, for final comment, to all members of CNOC, with copies to CBN and to CNIC. Appropriate members of IDCNS had reviewed the present draft. Final revision for publication in the light of comments received would be completed by Prof. RIGAUDY and Prof. W. H. POWELL. It would constitute Section H of *Nomenclature of Organic Chemistry*.

A joint working party of CNOC and CNIC led by Dr. K. A. JENSEN had drafted a Class I document on nomenclature of sulfur compounds; difficulties had arisen because of inappropriate analogies with phosphorus nomenclature. Several further projects had been developed jointly by CNOC and CBN. A Class III document on lipid nomenclature was awaiting retyping for distribution and final comments. A report on nomenclature of tetrapyrroles, after minor editorial changes, would soon be ready for distribution as a Class III document. One of three projected sections of a document on carbohydrate nomenclature had been completed. A Class I document on prostaglandins also has been drafted.

Dr. LOENING reviewed several projects of Commission IV.1 (Macromolecular Nomenclature). Main effort was being directed to stereochemical designations for macromolecules, for which provisional recommendations in the form of an Appendix to the IUPAC Information Bulletin were expected to be completed later this year (1976). Class I documents have been discussed on nomenclature and symbolism for corresponding biochemical materials. Future projects, on which little if any work had yet started, include nomenclature for ladder polymers, for inorganic polymers, and for interpenetrating polymer networks, and classification and family names of polymers.

Prof. SAMUELSON commented briefly on nomenclature studies in progress in Division V (Analytical Chemistry), which included a 'Compendium on Analytical Nomenclature'.

Dr. DYBKAER reviewed briefly projects in Clinical Chemistry now in progress but not yet at a stage ready for consideration by IDCNS (Quantities and Units of Properties Changing with Time, Quantities and Units in Optical Spectroscopy, Quantities and Units in the Acid - Base Field of Human Biochemistry). It was suggested that the word 'human' be changed to 'clinical' in the title of the last project. Action taken on two reports prepared by the Commission on Quantities and Units in Clinical Chemistry (CQUCC) and referred to IDCNS for consideration was recorded in Section 6 (a) of these Minutes.

IDCNS received with interest copies of a listing prepared by Mr. GUJRAL of all nomenclature, symbols, and terminology recommendations of IUPAC now in print, including references to where they may be found. This listing, after corrections have been entered, would be published in the *Information Bulletin* and up-dated thereafter as occasion required. (Note: This listing has been included in the present issue of the Bulletin—see pp. 18 - 29.)

Other Organizations

A joint IUB - IUPAB - IUPAC Commission on Biothermodynamics headed by Prof. I. WADSÖ had drafted a document entitled 'Recommendations for Measurement and Presentation of Biochemical Equilibrium Data', approved by the IUPAC Executive Committee for publication as a Provisional Nomenclature Appendix ('Yellow' booklet) to the *Information Bulletin*. The ICSU Committee on Data for Science and Technology (CODATA) was publishing the same document in its own typographical format in a forthcoming Bulletin now in press. Prof. HOFFMANN-OSTENHOF noted that officials of IUB had found the document rather too long and too elementary for its intended purpose.

Prof. McGLASHAN reported that the Comité consultatif des Unités (CCU) of the Comité international des Poids et Mesures (CIPM) had met this year and approved minor changes in the brochure describing the International System of Units (SI). At the previous meeting, two additional SI prefixes had been adopted (peta, $P = 10^{15}$, and exa, $E = 10^{18}$). Furthermore, special names had been accepted for two SI units for use in special applications (gray, $Gy = 1 \text{ J kg}^{-1}$, a unit of radiological absorbed dose, and becquerel, $Bq = 1 \text{ s}^{-1}$, a unit of radiological activity, such that $1 \text{ curie} = 3.7 \times 10^{10} \text{ Bq}$).

Prof. McGLASHAN noted that the Symbols, Units, and Nomenclature Commission (SUN Commission) of the International Union of Pure and Applied Physics had not met recently, but was being reconstituted in the aftermath of the death of its distinguished Secretary of long standing, Dr. U. STILLE. The new Secretary was Prof. L. VILLENA, who was IUPAP representative on IDCNS.

Prof. McGLASHAN reported also on recent activities of the International Organization for Standardization's Technical Committee 12 (ISO/TC 12): Quantities, Symbols, Conversion Factors, and Conversion Tables. A set of ISO/DIS 31 documents had been distributed for final discussion in an up-dating (at five-year intervals) of ISO Recommendations 31 covering Quantities and Units in eleven areas of the physical sciences and technology. These documents had been considered by IUPAC (and other organizations) in earlier drafts, and few changes were anticipated at the next meeting of ISO/TC 12 scheduled in Copenhagen (November 1976) to prepare final drafts for publication.

An unfinished piece of business for IUPAC concerns a request from ISO/TC 12, at the instigation of ISO/TC 47 (concerned essentially with standard methods of assaying industrial chemicals in international trade) for advice on defining equivalent amount of substance and a unit called the Val. In response to this request, Profs. H. M. N. H. IRVING and McGLASHAN, later succeeded by Prof. WHIFFEN, had been designated by IUPAC to meet with representatives of ISO/TC 12 and ISO/TC 47 as a joint task force to discuss the matter, but the meeting had not yet been convened, and the Executive Secretary of IUPAC had referred the question of IUPAC's participation to IDCNS, of which both Profs. IRVING and WHIFFEN were members. After considerable discussion, the following statement was approved by IDCNS for the Executive Secretary of IUPAC to transmit to ISO/TC 12:

"IUPAC's Interdivisional Committee on Nomenclature and Symbols discussed questions related to equivalent amount of substance, normality, the Val, and related matters. It wishes to affirm the view that the SI unit for equivalent amount of substance, however this amount of substance might be defined, is the mole, and that for volume concentration of equivalent amount of substance the SI unit is mol m^{-3} , with the commonly used multiple, mol dm^{-3} or mol l^{-1} . A clear and unambiguous general definition of 'equivalent amount of substance' is proving very difficult to produce and IUPAC has currently no suggestion to recommend and does not foresee a change in this position. Indeed IUPAC is not convinced of the need of a general definition".

Since Prof. IRVING was unable to attend the IDCNS meeting, the Committee felt that in view of his special competence and interest in

this matter, the proposed statement of IUPAC's position should be communicated to him so that he might comment on it before it was transmitted to the Executive Secretary.

3. Modus Operandi for IDCNS

Questions of regulating the flow of documents through IDCNS were further discussed (see Section 1 of these Minutes). IDCNS should receive all IUPAC nomenclature documents identified as Class II in order to assure that all interested parties were involved early enough to eliminate the hazard of substantial disagreement at a late stage in the preparation. Permission for an IUPAC document to pass from Class III to Class IV would ordinarily require Division approval before consideration and approval by IDCNS. Any nomenclature document received by IUPAC for comment from another organization should automatically be handled as Class II. The intention of IDCNS in its procedure is to stimulate the proper use of accepted IUPAC nomenclature and symbols, without stifling initiative.

Mr. GUJRAL informed IDCNS that a change was being instituted in the preparation of definitive documents for publication. These had previously been set in type. Beginning next year, Pergamon expected to receive all such documents in a camera-ready form. Since the Secretariat was not equipped to handle the large volume of manuscripts involved, it would be up to the originating Commissions to provide the camera-ready copy. IDCNS expressed keen interest in the correct printing and distribution of IUPAC products, and concern that the work that goes into the products not be nullified by faulty publication policy. It would be impossible, for example, for the Scientific Editors of the Union to ensure uniform copy editing of camera-ready manuscripts without sending them back to the authors for correction. Prof. McGLASHAN pointed out, furthermore, that special symbols available in hot-type were not usually to be had on typewriters. Dr. LIDE pointed to advances in the technology of manuscript preparation and editing by computer, which merit continuing attention by the Publications Committee and the Secretariat.

With regard to the responsibility of IDCNS for correct typographical detail in the manuscripts it was called on to approve, primary responsibility for such detail rested with the authors. IDCNS as a group and as individuals had strong secondary responsibility, and a duty to transmit to the authors any corrections perceived.

4. IUPAC and IUB

Prof. HOFFMANN-OSTENHOF reviewed the history of CBN, a major current joint activity of IUPAC and IUB. A Committee on Biochemical Nomenclature was founded within IUPAC in 1921. By 1960, it had produced few lasting results. In 1960 a new Commission was constituted with Prof. W. KLYNE as Chairman and Prof. E. C. SLATER as Secretary. In 1964, a decision was reached to form a joint CBN with IUB, to consist of ten members, five appointed by each Union. Prof. HOFFMANN-OSTENHOF was appointed Chairman and had so served up to the present. There had never been any distinction in the participation and contributions of the members based on which Union appointed them.

The present CBN had been quite successful. Twenty-two nomenclature documents had been published, some of them representing joint ventures with CNOC. A major project, taken over from the former IUB Committee on Enzymes, was the revision of *Enzyme Nomenclature*, published in 1972 after three years of effort. CBN had worked closely with IUB's Committee of Editors of Biochemical Journals (CEBJ), which had been helpful in every respect; excellent contact existed with authors of journal articles, who provide feedback through the editors.

Prof. HOFFMANN-OSTENHOF mentioned the valued services of the Office of Biochemical Nomenclature (OBN), maintained by the National Academy of Sciences - National Research Council with support from NIH. The Director of OBN, W. E. COHN, was Secretary of CBN; he had arranged for the publication, including proof-reading, of CBN recommendations in the various biochemical journals, as well as providing a consulting service to authors and journal editors through correspondence and other means.

Recently, discussion had been held between officers of IUPAC and IUB, at IUB initiative, to reduce the membership of CBN to eight (four appointed by each Union) and to establish a separate commission with its own Chairman and Secretary within IUB. Prof. P. KARLSON was to succeed Prof. HOFFMANN-OSTENHOF as Chairman of the joint CBN next year, and might have convinced the officers of IUB that one chairman for both Commissions should prevail. This plan to reorganize the nomenclature activities of IUB was approved at the General Assembly in Hamburg during July 1976. The IUPAC Executive Committee, meeting in Strasbourg at the time of the IDCNS meeting, was to consider IUPAC's part in the plan.

Prof. LOZAC'H commented on the need to assign responsibility for extending Section F of *Nomenclature of Organic Chemistry: Natural Products and their Derivatives*, including biochemically related compounds. CNOC had only two members prepared to carry on this work, and a link was needed with CBN. Biochemists did not have a general interest in natural products (such as terpenes and alkaloids), but were involved with amino acids, fats, carbohydrates, etc. These latter products should be the responsibility of a joint organic - biochemical group, but a new Commission on Natural Products was urgently needed in IUPAC to carry on the main assignment.

5. Problems of Ensuring Dissemination and Proper Use of Nomenclature Recommendations

A plan had been considered by the Publications Committee of IUPAC to consolidate the publications by enlarging the *Information Bulletin* (recently reduced from 3 to 2 issues per year) to 6 issues per year and to include therein the 'Yellow' provisional recommendations as well as definitive rules. Mr. GUJRAL responded to questions on this matter by informing IDCNS that the number of requests for the individual 'Yellow' Appendices averaged between 150 and 200, beyond the initial distribution by IUPAC, and that the number of paid subscriptions to the *Information Bulletin* itself had been built up to about 800. IDCNS took the view that aside from the inconvenience of distributing disparate sets of provisional recommendations together in a common binding, IUPAC could not properly solicit comments on its provisional recommendations while charging intended commentators the price of a subscription to the *Information Bulletin* (which would surely be substantially higher than at present) to receive the document. Therefore, IDCNS recommended that the Executive Committee continue to support the present successful system of distributing provisional nomenclature recommendations, as prepared for publication by the Secretariat.

Prof. LOZAC'H introduced a letter from Dr. L. C. CROSS [Director of Publications of The Chemical Society, member of IUPAC's Publications Committee and CNOC, and Secretary/Treasurer of the Association of Editors of European Chemistry Journals (Ed Eu Chem)], suggesting the value to IUPAC of a committee of editors similar to IUB's CEBJ in identifying nomenclature problems and in promoting wide distribution and use of accepted nomenclature recommendations. Dr. CROSS's letter suggested that

Ed Eu Chem might be a candidate to carry on such a function. Prof. HOFFMANN-OSTENHOF described briefly the structure and operation of CEBJ: It consisted of eight full members of whom only the Chairman and Secretary receive travel expense from IUB (the others receive travel support from their journals); forty journals receive all of the documentation; the biochemical nomenclature rules were well known, and were followed to a certain extent. Prof. HOFFMANN-OSTENHOF reiterated his opinion of the importance of OBN in the dissemination and correct use of recommended biochemical nomenclature, and expressed the view that chemical publications would benefit from the establishment of an agency with similar functions covering chemistry in general.

After careful consideration, IDCNS concluded that its Chairman should address an exploratory letter to Prof. G. OURISSON, Secretary General of IUPAC, and present Chairman of the Publications Committee, calling attention to IDCNS's concern for promotion of the use of IUPAC-recommended nomenclature, and suggesting that an international body be sought, covering the same area as IUPAC, through which IUPAC recommendations might be more widely disseminated and feedback to IUPAC from authors and journal editors might be effectively directed.

6. Review of Specific Documents

(i) *Revisions: 'List of Quantities in Clinical Chemistry, Recommendation 1977' and 'Quantities and Units in Clinical Chemistry, Recommendation 1977'*

Previous versions of these documents (Recommendations 1973) had been published in *Pure and Applied Chemistry*, **37**, No. 4 (1974). DYBKAER introduced the revisions by observing that differences of opinion that had arisen with the Expert Panel on Enzymes of the International Federation of Clinical Chemistry (IFCC) concerning quantities and units in enzymology had been resolved, and that the present revisions contain appropriate corrections, limited to the sections of the text that had been at issue.

Prof. McGLASHAN, supported by Prof. WHIFFEN and other members of IDCNS, took exception to use of the expression, 'functionally base unit' in connection with the unit 'katal', and to the introduction, without proper preparation, of the name, 'katal', itself, which they considered to be a special name for the SI unit, mol s^{-1} , in which the quantity, catalytic ability, as defined in these documents,

was measured. Such action contravened a carefully nurtured implicit understanding with other international bodies concerned with standardization of units, and particularly the SI, that IUPAC would not unilaterally introduce special names for SI units. The proper course would be for IUPAC to present CIPM/CCU a brief, reasoned request that katal be accepted as a special name for mol s^{-1} in the specific context of measuring the physical quantity called catalytic ability, defined by the rate of a specified catalyzed reaction under appropriately specified conditions. The justification for the request would be the value and actual growing use of such a special name in enzymology. Prof. HOFFMANN-OSTENHOF felt that IUB would strongly support such a presentation by IUPAC.

IDCNS concurred in recommending that the documents be revised to define katal properly as a special name used for the SI unit of catalytic ability, the mole per second, and that a note be included declaring IUPAC's intention to request CIPM/CCU for approval of this name, not now included in the SI, for use in its specifically restricted context. IDCNS would prepare such a request, on the basis of a justification of need and a definition of catalytic ability to be provided by CQUCC, for transmittal to CIPM/CCU as an IUPAC recommendation. IUB and IFCC would be informed of IUPAC's action, so that one or both may follow a similar course if they also feel the need to establish this special name for the SI unit of catalytic ability.

Aside from this major concern, Profs. HOFFMANN-OSTENHOF, McGLASHAN, SAMUELSON, and WHIFFEN had other comments that they would send to Dr. DYBKAER. Subject to CQUCC's accepting the IDCNS-recommended changes at its forthcoming meeting during the week following, the two documents were approved by IDCNS for publication as definitive IUPAC recommendations.

(ii) Selected Definitions, Terminology, and Symbols for Rheological Properties of Colloidal Systems and Surfaces

This document, intended for publication as an Appendix (Provisional Recommendation), was prepared by Commission I.6 (Colloid and Surface Chemistry) in consultation with the International Committee on Rheology (an Associated Organization of IUPAC), and revised and approved jointly by Commissions I.6 and IV.1 (Macromolecular Nomenclature) at the 1975 IUPAC Conference in Madrid. Commission I.1 (Physicochemical Symbols, Terminology, and Units) was also consulted during the drafting. It was assigned by IDCNS for detailed review to Dr. RING, who found nothing to which he would take ex-

ception. IDCNS approved publication, with minor editorial suggestions.

(iii) Initialled Abbreviations in the Chemical Literature

IDCNS consideration and approval of this document for publication is recorded in Section 2 of these Minutes. The working party to draft an IDCNS document on the same topic but along more general lines needed further opportunity for discussion. A Class I document would be prepared and distributed to IDCNS members and others, for further action at IDCNS's next meeting.

7. General Problems Concerning Membership and Administration of IUPAC Nomenclature Commissions

Prof. WHIFFEN described the present situation of Commission I.1. Having completed a major specific task in revising IUPAC's *Manual of Symbols and Terminology for Physicochemical Quantities and Units* (1969, 1973), there was a very important continuing assignment of a less well-defined character in maintaining surveillance over, and giving expert advice on, applications of the *Manual* in areas where other Commissions were working. It was difficult to justify full support for such a program, but without it there could be failure to utilize the expertise on symbols, terminology, units, and metrology in general that existed in the Physical Chemistry Division. Examples were mentioned in other areas (macromolecular nomenclature, enzyme nomenclature) where letting a standing Commission lapse resulted in a serious discontinuity that increased the difficulty of organizing the efforts of a successor group. After further discussion, the following resolution was approved:

"IDCNS in its discussion on the work of the Commissions recognized that a considerable part of the work of many individual commissions (one example would be I.1 on Physicochemical Symbols, Terminology, and Units) is of benefit to IUPAC as a whole rather than to the specific needs of the Division to which they are attached: such work includes advising other Divisions and IDCNS, and also representing IUPAC on outside bodies. The Committee hoped Divisions would recognize the need to maintain expertise for such extradivisional activities when acquiring and distributing Divisional resources".

Dr. LOENING commented on the successful experience of the nomenclature commissions with Wates - IUPAC Bursaries. The program, open to young investigators in the United Kingdom, was administered by the Royal Society, a committee of which had selected from among applicants fourteen recipients of travel awards to participate in IUPAC Commission meetings appropriate to their scientific interests.

This Scheme was being financed for three years 1976 - 78, as an experiment, and selections would be made annually. Commissions in which five Bursars were interested did not meet in 1976 but permission was given by the respective Chairmen that they could attend the meetings in 1977. The Secretariat applied to the appropriate Commission Chairman for an invitation to the Wates Bursar to attend. They report back to the Royal Society. Five had participated in meetings of CNIC and CNOC, and their contributions to the discussion had been highly valued. An effort in IUPAC was underway to interest other National Adhering Organizations in developing similar support to introduce their relatively unknown but competent younger investigators to the work of the IUPAC commissions, thereby establishing contacts for future titular membership.

Prof. LOZAC'H observed that the nomenclature commissions had two related but distinct functions: (i) making and improving existing rules (a quite complicated and exacting task), and (ii) controlling nomenclature in other commissions, publications, etc. Not much of this latter function could now be carried on effectively. Dr. LOENING had been serving informally as a source of advice on nomenclature to the chemical community. Possibly an increase in the number of Associate Members and National Representatives on the commissions would enable them to find the manpower needed to carry on this important function.

Comments were heard on the need for flexibility in applying rules for the rotation of commission memberships, when continuity of effort and stability of the recommendations were important considerations.

8. Date and Place of Next Meeting

The 29th Conference of IUPAC had been rescheduled in Warsaw to 12 - 21 August 1977. It was left to the Secretariat to schedule meeting times for IDCNS, with a preference for a half-day session on the opening day, followed by a whole day or two half-days scheduled on the third or fourth day of the Conference.

M. A. PAUL

REPORTS OF IUPAC-SPONSORED SYMPOSIA

V INTERNATIONAL CONFERENCE ON ATOMIC MASSES AND FUNDAMENTAL CONSTANTS

Paris, 2-6 June 1975

The Treaty of the Metre was signed in Paris on the 20th of May, 1875. Although the metric system had been declared legal in several countries prior to that time, this agreement established it as an international system of weights and measures and provided, *inter alia*, for the establishment of the International Bureau of Weights and Measures (Bureau International des Poids et Mesures—BIPM). Fifth International Conference on Atomic Masses and Fundamental Constants (AMCO-V) was one of two conferences held in Paris in 1975 as part of the celebration of the centennial of this event. The conference comprised almost one hundred papers from 17 countries. Total registration for the conference, which was held in the main auditorium of the Maison de la Chimie and at the Laboratoire Rene Bernas, University of Paris, Orsay, exceeded 200. Proceedings of the Conference has been published by Plenum Press, New York (USA).

Following opening remarks and words of welcome from Prof. H. CURIEN, Director General of the Centre National de la Recherche Scientifique (CNRS), and from the Chairman of the IUPAP Commission on Atomic Masses and Fundamental Constants, Nobel Laureate Prof. A. KASTLER and Prof. P. GRIVET presented an interesting review of historical facets of the conjunction of metrology and science, drawing an analogy between the interrelationships of the scientific, social and technological developments of the fifteenth and sixteenth centuries and their counterparts in the twentieth.

The conference covered several broad areas: high precision mass spectroscopy; reaction energetics and Q-values; atomic mass formulae; wavelength and frequency standards; the application of lasers to metrology and to precise physical measurements; fundamental physical constants, their determination and evaluation; and variations with time of the fundamental 'constants'.

Since the previous conference four years ago there has been an increased interest in mass spectroscopy of unstable elements, described

in papers by KASHY (USA) and by WOLLNIK (FRG), who have directly coupled the mass analyser system to a cyclotron or a nuclear reactor. TORGERSON and MACFARLANE (USA) reported on a time-of-flight mass spectrometer specifically developed for the measurement of masses of radioactive nuclei. Mass spectrometer systems of increasingly high resolution are being developed based on detailed analysis of ion optics, particularly in Japan: MATSUDA described a second-order double-focussing machine which is under construction and should achieve a resolution of several tens of thousands, while OGATA showed results obtained with his two-stage, double-focussing machine which has a resolution approaching one million.

As techniques of measurement and sensitivity of detectors improves, precision measurements of Q-values and of decay energies of increasingly unstable and short-lived nuclides become possible. Much current effort was evident in both the neutron deficient region ($N < Z$) and in the neutron rich region ($N > 2Z$) of the nuclidic mass surface. Q-value and β -decay energies in these regions not only are severe tests of nuclear systematics and of the various algorithms for predicting the masses of unmeasured nuclides, but also provide crucial tests of various mass formulae. There are two distinct uses of these models; one as an interpolation algorithm to estimate unknown masses or to distinguish between a nuclear ground state and a nuclear excited state, the other to gain physical understanding of nuclear matter, shell structure and deformed nuclei. Prof. BLEULER (FRG) presented a detailed review of these two domains. The emphasis in mass formula development presented at this conference was on 'local' formulae which describe the curvature (separation energies) and shell effects of the mass surface as opposed to 'global' formulae of the Weizsäcker type which had received attention in earlier conferences in this series.

Energetics and Q-value measurements can be combined with mass doublet measurements only if one has an accurate energy scale and an accurate conversion factor between mass and energy. In order to provide this energy scale there must be an accurate intercomparison of the several gamma-ray energies which are used as standards in these measurements. In two separate papers HELMER *et al.* (USA) and VAN ASSCHE *et al.* (Belgium) reported on the calibration of gamma-ray energies.

In the area of fundamental constants there was also much of interest. The ability to determine the wavelength and frequency of the methane-stabilized He-Ne laser at $3.39\mu\text{m}$ by a direct comparison respectively with the ^{86}Kr length standard and with the ^{133}Cs frequency standard

led the Consultative Committee for the Definition of the Metre to recommend, in 1973, the adoption of a new value for the velocity of light, $c = 299792458 \text{ m}\cdot\text{s}^{-1}$. It is now clear that absorption-stabilized lasers are superior to the ^{86}Kr lamp as a length standard, and a redefinition of the metre in terms of a new but as-yet undefined wavelength is to be expected. The measurements reported at this conference on laser wavelengths, lineshapes, and stability will be important in defining that wavelength in the future. We are also closely approaching the question as to whether they should be defined by a single atomic transition. If so, the product of the assigned wavelength and the assigned frequency of that transition is the speed of light, which would then be a defined quantity and no longer a constant to be measured. (This definition would apply to the speed of light at a given frequency and the question of the dispersion of light in vacuum would of course not be excluded or resolved.)

The fine structure constant, α , can now be determined to a precision of one part in 4 million, as reported by WILLIAMS (USA), based on his low-field determination with OLSEN of the proton gyromagnetic ratio. This precision has been made possible by careful and ingenious measurements of the solenoid coil geometry and dimensions combined with the extreme precision now possible in the determination of the Josephson-effect constant $2e/h$. This latter allows precise control and measurement of voltages and is now serving as the basis for the realization of the volt in several national laboratories and in BIPM.

One should not jump to the conclusion that all of the fundamental constants are known with this accuracy however, for the conference heard from DESLATTES (USA) of his direct measurements of the Avogadro constant, N_A , which is somewhat higher than the 1973 internationally recommended value. Furthermore, new measurements of the Faraday constant and measurements with increased precision of the gyromagnetic ratio in a high magnetic field, (KIBBLE, UK) are not consistent with this value of N_A . TAYLOR (USA) in an extremely lucid report of the situation showed that changes of the order of 5 to 10 ppm were necessary in one or more of these constants, or in the relationship between the SI ampere and the ampere as maintained and intercompared among the national standards laboratories of the world, but the exact source of the inconsistency could not be identified at present and would have to await further measurements, which would, it is hoped, be available before the next conference in three or four years.

E. RICHARD COHEN

I INTERNATIONAL SYMPOSIUM ON HETEROCYCLIC INORGANIC CHEMISTRY

Besançon, 16-19 June 1975

The first Symposium on Heterocyclic Inorganic Chemistry, organized by the Laboratoire d'Electrochimie des Solides of the Université of Besançon and the team of physical chemistry of cyclic inorganic molecules of CNRS, was held at the Science Faculty at Besançon (France). The international organizing committee consisted of Prof. G. CHAMPETIER, Prof. O. GLEMSER (President of the Inorganic Chemistry Division of IUPAC), and Prof. U. WANNAGAT.

Seven countries were represented by about 50 participants, mostly European. At the five meetings held under the chairmanships of Profs. O. GLEMSER, U. WANNAGAT, G. FERNANDEZ, HEAL and SHAW 29 communications of a very high level were presented. They were centred around two themes: heterocycles based on sulfur and those based on phosphorus. Thanks to the exemplary discipline of the participants, very fruitful discussions took place at the end of each lecture.

At the end of the symposium, all the participants met for a banquet followed by an excursion to the 'International Centre of Reflections on the Future' at the Salines Royales d'Arc et Senans.

The second meeting on this subject has been tentatively planned to be held in Federal Republic of Germany in 1978.

C. BERNARD

G. ROBERT

INTERNATIONAL SYMPOSIUM ON POLYMERIZATION OF HETEROCYCLES

Warsaw-Jablonna, 23-25 June 1975

The Symposium was jointly organized by the Centre of Molecular and Macromolecular Studies of the Polish Academy of Sciences in Łódź and by the Centre de Recherches sur les Macromolécules (CRM) du CNRS in Strasbourg. The Symposium was held in the centre for congresses of the Polish Academy of Sciences in Jablonna (near Warsaw) and the Opening Session was held in Warsaw, at the official building of the Polish Academy of Sciences. There were 110 participants (75 from abroad) from 19 countries; the largest groups came from USSR, France and USA.

At the Opening Session the President of the Polish Academy, Prof. W. TRZEBIATOWSKI, welcomed participants and stressed the importance of the long history of scientific cooperation between France and Poland for the development of science. In his opening remarks on behalf of IUPAC, Prof. H. BENOÎT, President of IUPAC Macromolecular Division, and Director of CRM-CNRS (Strasbourg), described the main activities of IUPAC and its Macromolecular Division.

It had been emphasized during the Opening Session, that ring-opening polymerization of heterocycles encompasses a number of fields. Indeed, important industrial polymers, like polyamides-nylons are prepared by ring-opening polymerization of lactams; major components of various industrial polyurethanes are prepared by ring-opening polymerization of cyclic ethers (propylene oxide, tetrahydrofuran) and cyclic esters (ϵ -caprolactone). Various silicones, polymers consisting of inorganic-Si-O-backbones are also prepared by polymerization of the corresponding cyclic siloxanes.

The other important direction is the preparation of biopolymers and their models. Indeed, the most commonly used methods of preparation of model polypeptides and of polysaccharides are based on the polymerization of *N*-carboxyanhydrides and anhydrosugars (bicyclic acetals), respectively. Recently, an attempt has been made to imitate the backbones of the nucleic acids by polymerizing cyclic esters of phosphoric acid.

All of these achievements are possible, because the polymerization of heterocycles provides methods which permit to make backbones containing different heteroatoms. This is in contrast with the polymerization of vinyl compounds, where carbon atoms constitute the chains of the macromolecules.

This broad field was covered during the symposium: 15 main lectures were presented, as well as contributed papers. Fourteen main lectures have been published in the IUPAC journal *Pure and Applied Chemistry*, Vol. 48, No. 3 (1976) and also as a separate symposium volume by Pergamon Press, Oxford. Keeping up with the high standards of the IUPAC sponsored Macromolecular Symposia, the speakers were of international reputation and authorities in their respective fields: organic chemists, physical chemists, industrial research chemists, and experts in the medical applications of polymers had opportunities to get together to discuss the new trends and uses of the polymerization of heterocycles.

M. SZWARC (USA) pointed out that polymerization of heterocycles proceeds exclusively by ionic mechanisms, and that the usual treatment

of the reaction kinetics in terms of equilibria between various ionic species should be applied. The scope and limitations of this approach were discussed thoroughly, especially from the point of view of the thermodynamical distinction between various ionic species coexisting in solution.

K. A. ANDRIANOW (USSR) presented new synthetical ideas in the field of silicones, but with a potential importance for the whole of polymer chemistry. It was shown, that bicyclic monomers, usually giving yield to polymer networks, can, under specific conditions, polymerize into linear polymers, containing rings in the main chain, similarly to the case of cyclopolymerization of divinyl monomers.

P. SIGWALT (France) summarized the present state of knowledge in stereoelection and stereoselection in polymerization processes. Stereoelection is particularly attractive as a possible method of preparation of optically active monomers by selectively polymerizing one of enantiomers from the racemic mixture.

The lecture of T. TSURUTA (Japan) gave a comparison of the conditions and general rules of polymerization of *N*-carboxy anhydrides and α -oxides. Methods of stereoelection and stereoselection elaborated for α -oxides have been successfully used also in the preparation of polypeptides. Various cases of stereoselection were discussed: when the configuration of the chain end, or structure of the counterion or some higher structural arrangements are responsible for choosing a specific enantiomer. Methods to distinguish between various mechanisms of selection were also discussed.

O. VOGL (USA) gave a general survey of the anionic and cationic polymerization of aldehydes, and emphasized two new points: the influence of the polymer structure and its ability to crystallize on the polymerization thermodynamics, and the specific characters of the polymerization of haloaldehydes. O. VOGL described for the first time the successful polymerization of bromal and discussed in detail the kinetics and mechanism of polymerization of chloral. This polymerization is reversible and the polymer is insoluble. Polychloral could be of industrial interest if convenient methods for its stabilization by end-capping are found.

The polymerization mechanisms of the 1,3-dioxacycloalkanes (DCA) were discussed by P. H. PLESCH (UK). For initiation by perchloric acid polymerizations proceed by ring-expansion. With other initiators the growth mechanism is still uncertain. The lecturer presented some evidence, favouring in his opinion the ring-expansion with tertiary oxonium ions as the active species. He discussed the

oxycarbenium ion as propagating centre and compared polymerizations of the DCA and cyclic ethers.

In H. CHERDRON's (FRG) paper, cyclic formals have been treated from the point of view of their technical importance. Various technological methods of preparing high - molecular weight polyacetals were discussed. The polymers are insoluble in the polymerization media and the topochemical aspects of polymerization become important on understanding of the technical process.

The next lecture also considered some new industrially important polymers, chloropolyethers based on monomers prepared by chlorination of butadiene. E. J. VANDENBERG (USA) especially stressed the stereochemical aspects of polymerization and the mechanical properties of the new polyethers, prepared at the laboratories of Hercules Inc.

T. SAEGUSA (Japan) described a new method of copolymerization of heterocyclic monomers. Properly chosen pairs of monomers A and B give strictly alternating copolymers (e.g. β -propiolactone and oxazalones). The base-acid (donor-acceptor) interactions are responsible for this 'no catalyst' alternating copolymerization. This method has also its counterpart in the vinyl polymerization: e.g. spontaneous copolymerization of nitrostyrenes with vinylidene cyanide.

N. S. ENIKOLOPYAN (USSR) described recent studies of the kinetics and mechanism of polymerization of cyclic ethers, performed at the Institute of Chemical Physics of the USSR Academy of Science. The reactions investigated are closely related to the curing process of epoxy resins and it was shown, that well defined network structures can be obtained by proper curing. This can have an important influence on the physical properties of the final products.

J. SEBENDA (Czechoslovakia) gave a thorough discussion of the basic thermodynamic dependences of the polymerizability of lactams. This treatment can, however, be applied to any group of heterocyclic monomers. Factors influencing enthalpy and entropy of polymerization were systematically described and the relation between the polymerizability and the rate of propagation was discussed.

E. J. GOETHALS (Belgium) summarized the existing knowledge on the formation of cyclic oligomers in cationic polymerizations of heterocycles. Apparently, the back - biting reaction, responsible for the formation of the macroheterocycles, is a general feature of the cationic polymerization of heterocycles. Polymerization of cyclic ethers thus provides ways to prepare macroheterocycles similar to crown - ethers.

J. SMID (USA) reviewed recent progress in polymerization, properties and some uses of the crown - ether substituted styrenes. The corresponding polymers have unusual properties and can be used as strongly complexing agents as well as membranes, controlling transport of biologically important ions. Some other biological uses were described, including interactions with polynucleotides.

V. KROPACHEV (USSR) devoted his lecture to biomedical polymers, prepared by ring - opening polymerization. Polypeptides, polysaccharides, models of nucleic acids were discussed. On the other hand, some polyethers, mainly poly(ethylene oxide) and copolymers of ethylene oxide with α - epichlorohydrin are promising drug - binding substances (to increase water solubility, or for prolonged action). Heterochain polymers, prepared by ring - opening polymerization, seem to be the right choice in this fast growing field, because some polymers belonging to this group are biodegradable [e.g. poly(α - hydroxyacids), polycaprolactone].

S. PENCZEK (Poland) described the mechanism of polymerization of cyclic esters of phosphoric esters. These monomers have three ester groups at the phosphorus atom. Two of them constitute the ring and the third one is an exocyclic group. The latter competes with the ring in reactions with growing species and this competition leads to low molecular weight products when the ring is not strained (e.g. six-membered ring). Polymerization of P-hydro substituted monomers avoids this transfer, involving the exocyclic ester group, and allows high polymers to be prepared.

Contributed papers were discussed in a separate session; a panel discussion was also organized in order to provide the opportunity to express some new ideas. This opportunity was not fully used at the Symposium.

The IInd Symposium on the Polymerization of Heterocycles will be organized in New Orleans (USA), within a framework of the ACS Meeting, in 1977.

P. REMPP

S. PENCZEK

XII EUROPEAN CONGRESS ON MOLECULAR SPECTROSCOPY

Strasbourg, 1-4 July 1975

European spectroscopists meet every two years to compare, analyse and discuss their results. The XII European Congress on Molecular Spec-

troscopy (ECMS) was held at Université Louis Pasteur in Strasbourg during 1-4 July 1975. About 400 participants registered for the Congress. Proceedings of the Congress has been published under the title *Molecular Spectroscopy of Dense Phases* (Editors: M. GROSSMAN, S. G. ELKOMOSS and J. RINGEISSEN) by Elsevier Scientific Publishing Company, Amsterdam, Netherlands.

Molecular Spectroscopy has become a very wide domain of research. In order to maintain the Congress in reasonable limits it was limited in scope to 7 topics. The Congress thus restricted was still big enough to justify a broad and comprehensive meeting. When it was over, most of the participants were thoroughly exhausted, but the organizers hope that they succeeded in giving some general coverage to the various broad approaches used for the general problem: How to analyse molecules by studying the light having interacted with them. This general formulation should be somewhat restricted by taking note of the fact that isolated molecules are already rather well known and that the main questions unsolved are those connected with the interactions which occur between nearby molecules in more or less dense phases.

Exciton effects is one of the basic problems involving interactions in crystals. This problem had been given attention on several occasions in ECMS since 1967. But the important developments of the field of *exciton interactions at high concentration* justified a special session on this topic. Profs. S. NIKITINE, H. HAKEN and H. C. WOLF introduced a detailed analysis of this problem. If the crystal is considered as a box containing excitons, the main interesting phenomena which can occur in that box are: the formation of excitonic molecules, the formation of electronhole drops, the BOSE-EINSTEIN condensation. The transient phenomena analysis has a critical role in these questions which raise some fascinating possibilities from two points of view:

—Physical: the formation by the excitons of new phases of matter within the matter, new types of light propagation in the matter such as self-induced transparency, superadiant state, photon echoes, etc.

—Chemical: excitonic molecules, their kinetics of formation and their interactions.

The solutions to these questions raise the possibilities of many interesting applications in devices which could be useful in the various fields of light sources, switching and modulating systems for integrated optics, pollution control, etc.

Spectrometric studies of phase changes in crystals was the second basic problem studied in the Congress. In this case the spectrometers are using not only protons but also neutrons. Prof. J. F. SCOTT intro-

duced the discussion from the point of view of Raman spectroscopy which has a long history of successes in determining structures of gas-phase molecules. This technique appears equally able to reveal subtle solid state configurations. Prof. B. DORNER analysed inelastic scattering from monocrystalline samples by thermal neutrons with three axis instruments. The neutrons, having wavelengths comparable to interatomic distances and energies in the range of those of collective excitations in condensed matter, provide a wonderful tool to study atomic motion and their correlations near phase transformation. Other contributors explained the new possibilities of X-ray and infrared analysis which have been developed during the last two years.

Matrix spectroscopy of molecules, radicals and ions was the third topic analysed in detail. Profs. D. SHEPPARD, K. DRESSIER, and J. P. PERCHARD covered this subject. They showed the important progress made recently. The possibility of measuring spectra from very low concentrations of guest in the host lattice allows to follow through many orders of magnitude the evolution of interactions from guest-host to guest-guest not only statically but also taking into account the dynamical effects.

The fourth topic analysed was that of *induced spectra in dense fluids*. Profs. B. VODAR, L. GALATRY and J. VAN DER ELSKEN analysed the influence of molecular dynamics on the spectra. In this case, an increase of pressure tends to play a role very similar to that of an increased concentration of guest in the in-matrix spectra. But dynamical effects are much more important here than in the preceding case. The experimental measurements on gases cover a range of density and pressure going from the free-molecule-situation to the density-similar-to-that-of-the-solid-situation. It is thus possible to obtain a fairly complete picture of the microdynamics and of the interaction mechanism. It is to be hoped that this powerful technique will be extended to a wider range of systems in the next years.

The fifth topic analysed was that of *short range order in liquids*. The current state of the problems of solvation was discussed by Profs. P. DRYJANSKI, D. E. IRISH, M. L. JOSIEN and Z. KECKI. Raman and infrared spectra of vibration and rotation are sensitive tools. It is however necessary to use rather sophisticated techniques to obtain the data and analyse it. Detailed values of frequencies as well as intensities of the characteristic lines allow to study solvation and solvent structure. Order at least on short range can be produced in liquids by hydrogen bonds or non-hydrogen bonded groups producing dipole interaction. Spectral analysis allows to determine accurately the number

of solvent molecules constituting the shells of solvation and to evaluate their binding forces. Some other techniques (X-ray, n.m.r.) confirm in a striking manner the results of spectral analysis. It remains to extend the measurements to a wider range of solutions.

Profs. B. J. BERNE and P. LASCOMBE introduced the discussion of the sixth topic *Vibrational and rotational relaxation in dense phases*. The fluctuations due to relaxation determine the shapes of the Raman and infrared bands. Careful spectral measurements allow to choose which model of rotational and vibrational relaxation occurs in a given system. The problem of the interaction between rotational and vibrational relaxation is also solved. Spectroscopic techniques appear as the best tool available for the study of the orientational movements of molecules in gases, liquids or solids. It is not necessary to underline the many possible applications.

The last topic was that of *methodological and technological developments and innovations* introduced by Profs. L. GENZEL, A. MARECHAL and J. STONE. They clearly showed that new developments are in the right direction to solve the 'ultimate problem of spectroscopy'. The spectral range covered by c-w lasers and by picosecond lasers is broadening.

Wide aperture, high luminosity (but unfortunately not yet high resolution) pocket spectrographs are on the way. Imaging spectrographs are almost in sight. The cost problems are unfortunately not easy to solve. Yet the use of the new equipment beginning to be available will certainly produce wonderful results in the following years.

It is our hope that the questions raised and the elements of solution discussed will help many in their work during the next two years and that much progress will be reported at the XIII ECMS.

M. GROSMANN

XXV INTERNATIONAL CONGRESS OF PURE AND APPLIED CHEMISTRY

Jerusalem, 6 - 11 July 1975

The twenty-fifth International Congress of Pure and Applied Chemistry (of IUPAC) took place at the Hilton Hotel in Jerusalem (partly also at the Binyanei Haaoma Convention Center), under the patronage of Prof. E. KATZIR, President of the State of Israel, and under the auspices of the Israel Academy of Sciences and Humanities, the National Research Council for Research and Development, and the

Hebrew University of Jerusalem, at the invitation of the Israel Chemical Society.

About 1100 participants attended the Congress, of whom some 700 came from abroad, in spite of the high costs of transportation. Some assistance was received in this respect from public bodies in France, Federal Republic of Germany, UK and USA. Regretfully, no attendants could come from the Soviet Union and Eastern European countries except Romania. In all, 26 countries were represented at the Congress.

The lecturers had to compete with the attraction of the ancient multinational city, augmented by the fine weather that lasted throughout the Congress. The facilities on the premises of the Hilton Hotel, were equally pleasant, so that the lecture halls were reasonably full. The social program included an informal get-together at the Hilton Hotel on the evening of 6 July, prior to the opening of the Congress, by invitation of the Israel Chemical Society, the host being its President, Prof. D. LAVIE. The opening ceremony, was held on the evening of 7 July, in the grand ballroom of the Hilton Hotel. It was dedicated to the memory of the late President of the Congress, Prof. E. D. BERGMANN. A moving memorial address was given by Prof. E. KATZIR, and greetings were conveyed by Prof. Y. MARCUS (Chairman, Organizing Committee of the Congress), by Prof. Sir HAROLD THOMPSON (President, IUPAC), by Prof. D. LAVIE (President, Israel Chemical Society), Mr. A. SHAVIT (President, Manufacturers Association) and Dr. M. MANDELBAUM (Director, Ministry of Commerce and Industry). An illustrated lecture on New Archeological Discoveries in Israel by Prof. A. BIRAM, Director of the Nelson Glueck School of Biblical Archeology, was warmly applauded. A reception held on behalf of the Mayor of Jerusalem at the Israel Museum on the night of 8 July, gave the participants the opportunity to observe the many fine exhibits which illustrate this cultural and historical heritage. The audience heard addresses by the Deputy Mayor, Dr. J. GOLDSCHMIDT, and the President-Elect of IUPAC, Dr. R. W. CAIRNS. The closing social event was an Israeli Folklore performance of dance and song, held at the Binyanei Haaoma Convention Center adjacent to the Hilton Hotel, where also an invitation to the XXVIth IUPAC Congress to be held in Tokyo in 1977 was delivered by Prof. M. OKI.

The scientific program included seven plenary lectures and some thirty main section- and symposium-lectures, in the four divisions: organic, physical, medicinal and applied chemistry. The latter division

also included three industrial plant tours as a part of the program, by invitation of the plants and the Ministry of Commerce and Industry. The plenary lectures were delivered by S. SPIEGELMAN (New York) on 'A Molecular Approach to the Etiology of Human Cancer', by E. HAVINGA (Leyden) on 'Aromatic Photosubstitution Reactions', by D. HERSCHBACK (Cambridge, USA) on 'Molecular Dynamics of Chemical Reactions', by G. WILKE (Mühlheim) on 'Homogeneous Transition-Metal Catalysts in Applied Chemistry', by H. C. BROWN (Lafayette, USA) on 'Organoboranes—The Modern Miracle', by J.O.'M. BOCKRIS (Bedford Park, Australia) on 'The Energy Future and the Chemical Fuels' (which was a part of the symposium on 'Chemical Aspects of Future Energy Sources'), and by E.B. Wilson (Cambridge, USA) on '50 Years of Quantum Chemistry' (which was a part of the symposium on the same subject). These lectures, with the exceptions of that by WILKE, have been published in the IUPAC journal *Pure and Applied Chemistry*, Vol. 47, No. 1 (1976) and as a separate volume by Pergamon Press, Oxford.

In the division of organic chemistry, the sections and main speakers were: new theoretical insights into organic molecules (K. FUKUI, Kyoto); chemistry of excited states (K. SCHAFFNER, Geneva); novel instrumental methods of structure determination (D. H. WILLIAMS, Cambridge, UK); computers in organic synthesis and structure determination (W. T. WIPKE, Princeton, and J. E. DUBOIS, Paris); novel synthetic applications of organometallic compounds; ylid chemistry (G. WITTIG, Heidelberg); prebiotic chemistry and organic geochemistry; approaches to the structure of biological receptors (see below, division of medicinal chemistry); and stereochemical aspects of biogenesis (D. LAVIE, Rehovot). About 90 discussion papers were also presented.

In the division of physical chemistry, the sections and main speakers were: condensed phases (F.H. STILLINGER, Murray Hill, USA); lasers in chemistry (C.B. MOORE, Berkeley); molecular spectroscopy (I.G. ROSS, Canberra); molecular dynamics (R. BEHRSON, New York); interfacial electrochemistry (H. GERISCHER, Berlin); molecular structure (D.A. SHIRLEY, Berkeley); molecular conformations (P.G. De GENNES, Orsay); and the symposium '50 Years of Quantum Chemistry' (B. PULLMAN, Paris, R. B. BERNSTEIN, Austin, USA, and L. SALEM, Paris). Some 100 discussion papers were also presented.

In the division of medicinal chemistry, the sections and main speakers were: intermediate products in drug metabolism as a basis of

drug action and toxicity (J. R. GILLETTE, Bethesda, USA); compounds modulating biosynthesis and degradation of prostaglandins; chemotherapy of tropical diseases (P. SENSI, Milan, and L. M. WERBEL, USA); chemotherapeutic agents (R. K. ROBINS, Irvine, USA); the symposium 'chemistry of memory' (G. UNGAR, Houston, S. H. BARONDES, La Jolla, and S. P. R. ROSE, Milton Keynes, UK); a miscellaneous section; and a joint section with the organic chemistry division, on approaches to the structure of biological receptors (J. P. CHANGEUX, Paris). Some 30 discussion papers were also presented.

Finally, in the division of applied chemistry, the sections and main speakers were: new techniques in chemical processing (A. BANIEL, Haifa); a symposium on 'chemical aspects of future energy sources' (D.M. GRUEN, Argonne and G. STEIN, Jerusalem); food resources through chemistry; surface chemistry and surface activity (D. H. EVERETT, Bristol); chemical processes of water desalination (S. LOEB, Beer Sheba); recycling and reuse of wastes (G. TEILIG, Frankfurt); and Israeli chemical industry (G. CEVIDALLI, Jerusalem, R. HABER, Ramat Gan and D. VOFSI, Rehovot)—including plant tours to Sdom, Beer Sheba and Jerusalem, in the areas of heavy inorganic chemicals, pesticides and pharmaceuticals respectively. Some thirty discussion papers were presented in this section.

The main section lectures and the symposium lectures have been published as a special volume of the *Israel Journal of Chemistry* by the Weizmann Science Press of Jerusalem.

Y. MARCUS

SYMPOSIUM ON REFERENCE METHODS IN CLINICAL CHEMISTRY

Toronto, 17 July 1975

A one-morning session dedicated to the subject of reference methods in clinical chemistry, and cosponsored by IUPAC, was held during the International Congress on Clinical Chemistry, 13 - 18 July 1975 in Toronto, Canada. This Congress held triennially brings together representatives of and participants from 32 national clinical chemistry societies. Attendance at the week long meeting was over 3,500, with several hundred in attendance at this symposium.

Interest in the world today toward the goal of improving the reliability of clinical measurement was at an all-time high, said Dr. G. N.

BOWERS, Jr. (USA) in his introductory remarks. He further pointed out that one way of achieving this goal was through the development and implementation of reference methods and reference materials of demonstrated accuracy; that when measurements were made on the basis of accuracy, then measurement compatibility must logically follow.

In his paper on '*The Rationale for Reference Methods in Clinical Chemistry*', J. PAUL CALI (USA) discussed how, in principle, compatibility in measurement can be achieved through accuracy. By compatibility is meant the ability of all laboratories in a network to obtain similar and reliable numerical values on a given sample for the property under test. To obtain this result in practice requires three levels of methodology and three types of reference materials. At the highest level of accuracy is the *definitive method*, one having direct access (or directly traceable to) the base or derived units of measurement, and *pure reference materials*. These methods and materials are usually developed in national laboratories at high cost and with a high level of sophistication. The transfer of this high level of accuracy to the next tier of laboratories is accomplished through *reference methods* and *matrixed reference materials*. These methods and materials are more suited to implementation and use by clinical reference laboratories and the manufacturers of *secondary reference materials*. In turn, these materials are used at the local level to control the quality and accuracy of the *routine methods*. This hierarchy of methods and materials was discussed in some detail, with special emphasis on definitive methods because of their current paucity and difficulty. Finally, suggestions were made as to how such a measurement network could be set in place on an international scale.

Dr. H. BÜTTNER (Federal Republic of Germany) reported on the 'International Federation of Clinical Chemistry (IFCC) and Reference Methods'. In his paper he showed how the IFCC is working in this field through several Expert Panels of the Committee on Standards. The reference methods concept of IFCC and proposals for definition of terms in the field of clinical chemistry developed by the Expert Panel on Nomenclature and Principles of Quality Control was discussed in detail. A description was given of the way in which recommendations are prepared on reference methods and how consensus within the community of clinical chemists is reached. Special examples from the work of the Panels on proteins, bilirubin, enzymes, and quality control, was presented. The cooperation of IFCC with other international scientific organizations and with the World Health Organi-

zation is important for the wide acceptance of reference methods. Progress and problems in this field were also reported.

In his paper on 'The Development of a Clinical Reference Method for Glucose in Serum', Dr. R. SCHAFFER (USA) reported work currently underway at the National Bureau of Standards (USA) with progress as of July 1975. The hexokinase glucose-6-phosphate dehydrogenase method for determining glucose was selected as the candidate clinical reference method. Its use in all laboratories performing the round-robin tests was shown to provide high precision values. Its accuracy is being evaluated against the results of isotope dilution-mass spectrometry (ID - MS) as the *definitive method* for glucose. Work as yet incomplete shows some erratic differences between the ID - MS and the candidate clinical method. More is to be done with ID - MS to ensure the validity of its values before further efforts on the clinical reference method are undertaken. Results to date are, however, very encouraging and accuracy of the definitive method at the 1% level seems to be well within reach.

Finally, Dr. F. L. MITCHELL (UK) summarized in his paper 'The Practical Application of Reference Method Technology' how this philosophy of measurement may find use in the practice of clinical chemistry. The main value of reference technology will be in the selection of techniques for service use and in defining reference ranges for the concentration of substances in the body fluids of normal individuals. Initially it should find application in the present national and international quality control schemes to distinguish those techniques which, as currently operated, are sound, from those in which accuracy can be demonstrated to be faulty. Over the long-term it is to be expected that when new techniques for service use are submitted for publication, they should not be accepted unless the results which they have produced have been satisfactorily compared with results obtained by the appropriate reference technique. Reference technology is likely to be required for four main purposes: (i) The assay of commercial quality control materials; (ii) The assay, either in prospect or retrospect of material used in national quality control programs; (iii) 'One off' measurements required by individual laboratories for development work on instruments and methods; (iv) For monitoring the effects of drugs or their metabolites, etc. Definitive methods will almost certainly always be difficult and will be required only rarely, but even reference methods will not be easy to set up and are likely to prove uneconomic to keep running for individual laboratories to be able to do their own assays as required. Therefore centers need to be

designated to carry out certain assays on a national and international basis.

The four papers referred to above have been published in the IUPAC journal *Pure and Applied Chemistry*, Vol. 45, No. 2 (1976) by Pergmon Press, Oxford.

J. P. CALI

XV PRAGUE MICROSYMPOSIUM ON MACROMOLECULES: DEGRADATION AND STABILIZATION OF POLYOLEFINS

Prague, 21-24 July 1975

'Degradation and Stabilization of Polyolefins' was the theme of 15th Microsymposium held at the Institute of Macromolecular Chemistry of the Czechoslovak Academy of Sciences in Prague from 21 to 24 July 1975. 164 active participants from 21 countries were present at the meeting. Prof. V. HEROUT represented IUPAC in the opening session. Eight main lectures and 44 communications divided into seven sessions were presented during the Microsymposium; the main subjects of the Microsymposium were dealt with in three panel discussions. The full texts of a number of main lectures and communications will be published in the *Journal of Polymer Science, Part C (Polymer Symposia)*.

The Microsymposium was opened by a lecture of N. C. BILLINGHAM (UK) who discussed the effect of crystallinity of poly (4-methylpentene-1) on the oxidation and stabilization process. The main attention was concentrated on the role played by the diffusion of oxygen and on the distribution of antioxidant in the polymer bulk. A. L. BUTCHATCHENKO (USSR) summarized the data on the kinetic specific features of the oxidation of polyolefins in the solid phase and discussed the individual partial processes of the complicated overall reaction mechanism. The results obtained in the study of oxidation of n-alkanes and their application to the investigation of the oxidation of polyolefins were presented by I. P. SKIBIDA (USSR). She reported data about the relative contribution of alkyl peroxy and alkyl hydroperoxides to the decomposition of the polymer chain, the data about the role of alkyl radicals and the effect of the oxidation products on chain branching. The findings concerning the stabilization mechanisms of polyolefins were summarized by W. L. HAWKINS (USA), who investigated the terminators of kinetic chains, decomposers of hydroperoxides, and synergism and devoted special atten-

tion to deactivators of metals. New data about the role of carbon black in the photostabilization of polyethylene and their effect on the mechanism of oxidation stabilization were included. The thermo- and photo-oxidative characteristics of polypropylene were discussed in detail from the practical viewpoint by H. P. FRANK (Austria). He related data obtained by experiments in melt and in the solid phase in presence of stabilizers. Complex data about the antioxidative properties of aminomethylated indoles and aminopyrazoles tested in the oxidation of tetralin were given by M. SCHULZ (GDR). The mechanism of the effect of such compounds was discussed on the basis of isolated transformation products. The data were used in the synthesis of compounds having an increased antioxidative activity. The photolysis and photo-oxidation of polyethylene containing various amounts of keto groups were the subjects of the lecture by J. E. GUILLET (Canada). This type of polymers is important from the ecological standpoint. Results obtained by means of the copolymers of ethylene with methyl vinyl ketone, methyl isopropenyl ketone and carbon monoxide were reported, and the separate facts were theoretically interpreted. The closing lecture by G. SCOTT (UK) was based on the overall knowledge of the complex role played by alkyl hydroperoxides in the photooxidation and thermal oxidation of polymers while dealing at the same time with their uses in the controlled stabilization of polyethylene. An analysis of the participation of ions of transition metals in the overall process and its modification by chelation were included in the lecture. The photolytic stability of complexes thus formed is the conclusive factor in the final effect upon the whole process; theoretical analyses were applied in practice.

Panel discussions made possible useful confrontation of varied scientific findings, thus providing basis for extending their practical applications and confirming the importance of the individual research trends. In the discussion of the mechanisms and characterization of degradation processes (Chairman: D. J. CARRSSON, Canada), the insufficiently known aspects of degradation were predominantly stressed, and the process of their elucidation was analyzed. Special problems arising in the practical investigation of the stabilization of polyolefins were dealt with in a discussion (Chairman: M. FEDTKE, GDR) in which views about the rational choice of stabilization systems and the individual aspects important for the evaluation of the suitability of stabilization components were confronted. The uses of the knowledge of the degradation and stabilization of polyolefins in the investigation of ecological problems were discussed (Chairman: Z. OSAWA,

Japan) by using experimental data obtained so far while respecting some pertinent technical and economical relations.

The main lectures and panel discussions created for the participants a source of important information about the progress in scientific research and in the experience obtained by using scientific findings in practice. Confrontation led in some cases to their natural synthesis, while always arousing interest in problems involved in this particular domain which is important from the scientific, technical, and economic standpoint. The scope and variety of problems under investigation were documented in almost 50 communications presented at the meeting.

B. SEDLÁČEK

IV INTERNATIONAL SYMPOSIUM ON CAROTENOIDS

Berne, 25-29 August 1975

The fourth triennial meeting of what has come to be known as the 'Carotenoid Club' held in Berne (Switzerland) was attended by some 150 persons drawn from 16 countries in 5 continents. There were 15 main lectures (of which 13 have been published in the journal *Pure and Applied Chemistry* and as a separate Symposium Volume by Pergamon Press, Oxford) and 48 contributed papers. These ranged widely over all aspects of the subject.

Prof. S. LIAAEN-JENSEN reviewed the progress made over the last 5 years in elucidating the structures of natural carotenoids (over 90 new structures have been reported in this period!), Dr. G. P. MOSS described developments in the application of ^{13}C n.m.r., c.d., and laser Raman spectroscopy, and Dr. J. SZABOLCS methods for the assignment of configuration to a number of *cis*-carotenoids. Prof. B. C. L. WEEDON reviewed synthesis, Prof. S. M. MAKIN described the dienyl ether routes, Dr. H. MAYER reported the first total synthesis of zeaxanthin with the natural 3R, 3'R configuration, and Dr. F. KIENZLE critically evaluated the problems involved in the manufacture of carotenoids.

Legal and health considerations were covered by Profs. G. ZBINDEN and O. WISS. Drs. B. H. DAVIES and G. BRITTON reviewed different aspects of biosynthesis, and Prof. W. RAU gave an account of photoinduction. The carotenoproteins were discussed by Dr. P. F. ZAGALSKY, the glycosides by the indefatigable local organizer of the meeting, Dr. H. PFANDER, and two important classes of natural

products related to the carotenoids, the trisporic acids and abscisic acid, by Prof. J. D. BU'LOCK and Dr. R. S. BURDEN.

On Thursday afternoon 'the Club' was transported to the top of the Shilthorn (2970 m) for the Conference Dinner. The members took this opportunity to present an engraving to Dr. O. ISLER, the god-father of the Club, to record on the occasion of his retirement their deep appreciation of his many outstanding contributions to the chemistry of vitamin A and the carotenoids. On behalf of the Eidgenössische Technische Hochschule (ETH) in Zürich Profs. H. ZOLLINGER and D. ARIGONI presented Dr. ISLER with a Diploma of Honour, and other tributes were paid by Profs. H. SCHMID and J. W. PORTER.

The symposium was closed on the Friday by Prof. T. W. GOODWIN who referred to the fact that 'the Club' was obviously in good heart, and to the pleasure that the older members had had in seeing (and hearing from) so many new faces.

B. C. L. WEEDON

IV INTERNATIONAL CONFERENCE ON CHEMICAL THERMODYNAMICS Montpellier, 26-30 August 1975

After Poland in 1969, the United States of America in 1971 and Austria in 1973, the Fourth Conference was held in France, in Montpellier, at the Université des Sciences et Techniques du Languedoc. The Conference was sponsored by IUPAC, with the participation of the Société Chimique de France, the Société Française de Chimie Physique and the Société Française des Thermiciens, with financial support from the following French organizations: Direction des Recherches et Moyens d'Essais, Centre National de la Recherche Scientifique et Technique, and the Université des Sciences et Techniques du Languedoc. It attracted about 400 participants, three quarters of whom came from almost thirty countries all over the world. Ten plenary lectures and more than 200 lectures were presented by eminent scientists. These lectures and plenary lectures were grouped according to the following eight themes: (i) Thermochemistry; (ii) Thermophysics (heat capacity); (iii) High Temperature Thermodynamics; (iv) High Pressure Thermodynamics; (v) Thermodynamics of Systems of Biochemical Interest; (vi) Thermodynamics of Fluid Mixtures; (vii) Thermodynamics of Surfaces; (viii) Recent Progress in Experimental Techniques and Apparatus in Chemical Thermodynamics.

The scope of the conference and the 8 themes were selected by an international Scientific Committee comprising the following: M. LAFFITTE (France), President; C. B. ALCOCK (Canada); E. BONNIER (France); J. BOUSQUET (France); G. DE MARIA (Italy); D. H. EVERETT (UK); H. V. KEHIAIAN (France); F. KOHLER (Austria); O. KUBASCHEWSKI (FRG); M. McGLASHAN (UK); K. N. MARSH (Australia); V. A. MEDVEDEV (USSR); A. PACAULT (France); A. POTIER (France); J. M. PRAUSNITZ (USA); S. SEKI (Japan); B. VODAR (France); I. WADSÖ (Sweden); E. F. WESTRUM, Jr. (USA).

The opening ceremony was held in the Grand Amphitheatre of the University, in the presence of personalities from the City and Prefecture, delegates from the societies supporting the Conference and one from the Académie Française des Sciences.

Following the tradition of the three previous Conferences, four official languages were recognised: English, French, German and Russian. Moreover, as an act of recognition of this fact, Prof. M. LAFFITTE, President of the Conference, welcomed the participants in the four languages, thanking all who had helped him to organize the Conference. Then, Prof. S. SUNNER, representing the International Union of Pure and Applied Chemistry, recollected the aims and form of this organization, free of any political obligation or affiliation, created by chemists on a voluntary basis. Finally, Prof. A. POTIER of the Université des Sciences et Techniques du Languedoc, emphasized mainly the role, national as well as international, played by Montpellier in the academic sphere. These two speeches were made both in French and English.

For each of the eight selected themes (indicated above), a lecturer was specially requested to review the subject and suggest possible lines of research:

Prof. C. E. VANDERZEE (USA)—Recent Problems and Strategies in Thermochemistry

Prof. F. GRØNVOLD (Norway)—Heat Capacities in Critical Regions

Dr. P. J. SPENCER (UK)—Measurement and Applications of High Temperature Metallurgical Thermodynamic Data

Prof. G. M. SCHNEIDER (FRG)—High Pressure Thermodynamics of Mixtures

Prof. P. L. PRIVALOV (USSR)—Thermodynamical Investigations of Biological Molecules

Prof. D. PATTERSON (Canada)—Effects of Molecular Size and Shape in Solution Thermodynamics

Dr. J. ROUQUEROL (France)—A Few Aspects of the Recent Developments of the Thermodynamics of Interfaces

Prof. Y. TAKAHASHI (Japan)—Recent Developments in Experimental Methods for Heat Capacity Measurements

In addition to these eight plenary lectures, Prof. F. D. ROSSINI of Rice University (USA) gave a plenary lecture entitled 'Fifty Years of Thermodynamics and Thermochemistry'. As a payment of homage to Prof. ROSSINI for his services to thermochemistry, the Commission on Thermodynamics and Thermochemistry of the IUPAC decided to create the 'Rossini Lecture', which will henceforth be part of all its international conferences on chemical thermodynamics. This 'Rossini Lecture' will always be given by an eminent scientist in the field of chemical thermodynamics. Finally, Prof. A. PACAULT (of the Centre de Recherches Paul Pascal de Talence, France) gave a lecture entitled 'Introduction to the Study of Periodical Chemical Reactions: Experimental Presentation'. It should not go unnoticed that all these plenary lectures were attended by large audiences.

In the course of this Fourth Conference, a round-table, directed by Prof. C. B. ALCOCK (of the University of Toronto, Canada), for high-temperature physico-chemical techniques was organized. Two short films were also shown: one on periodical chemical reactions which was presented by Dr. J. K. PLATTEN from the University of Mons (Belgium); the second, entitled 'Entropy', by R. BATTINO, D. J. KARL, Th. LISTERMAN and Ph. MALON (from Wright University, USA), was presented by Dr. L. CLEVER from Emory University (USA).

In selecting the lectures to be presented at the Conference, the members of the Scientific Committee anticipated that theoretical, experimental and industrial aspects of the chosen themes would be discussed. In this respect, the Fourth Conference was a success. Scientific equipment was exhibited by two French firms, Arion and Setaram, both well-known in the construction of calorimeters and thermal analysers.

The eight plenary lectures have been published in *Pure and Applied Chemistry*, Vol. 47, No. 4 (1976) and as a separate Conference Volume by Pergamon Press, Oxford. Texts of all other lectures have been published in a set of nine booklets (cost: 150 FF, plus postage and package charges) available from Dr. R. SABBAGH, Centre de Recherches

INTERNATIONAL SYMPOSIUM ON MARINE NATURAL PRODUCTS

Aberdeen, 8-11 September 1975

The Symposium was held in the Chemistry Department of the University of Aberdeen (Scotland). It was the first meeting on this topic in Europe, indeed the first outside North America, and it attracted about a hundred participants. Sixty of these came from overseas, principally from Western Europe, and also from Canada, USA, Turkey, Poland, South Africa, Australia and Japan. Worldwide, the number of laboratories working in this field is relatively small, and nearly all were represented. Many research workers in this field had the opportunity to meet each other for the first time, and this was much appreciated.

On the first day A. J. WEINHEIMER (Oklahoma) and B. TURSCH (Brussels) gave extensive accounts of the terpenoid compounds in coelenterates and alcyonarians, respectively. These organisms, abundant on coral reefs, elaborate a wealth of diterpenes and sterols, and many novel compounds were reported. Most of these may be described as 'marine variations' of terrestrial forms, usually a structural variation, but sometimes the marine metabolite is the optical antipode of a compound previously isolated from a terrestrial species. Other 'marine variations' were described by L. MINALE (Naples) in a comprehensive review of natural products from sponges collected in the Bay of Naples. Marine sterols frequently have unusual sidechains (i.e. different from the 'normal' types found in terrestrial species), and sponges provide several examples as well as others in which the A ring is five-membered. Sesquiterpenes are also abundant in sponges and to date they are the best source of sesterterpenes. The first isolation of the parent compound geranylarnesol, from a sponge was reported by R. J. WELLS (RRIMP, Dee Why, NSW, Australia). Halogenated compounds, especially bromo derivatives, are widely distributed in marine organisms, especially in sponges and algae. There is now evidence that some of the halogenated animal metabolites are derived from algal sources in their diet, and it seems likely that many of the compounds found in marine animals ultimately derive from algae. It was shown (G. SODANO, Naples) that the sterols in *Axinella* sponges are of dietary

origin while *Marthasterias* starfish can biosynthesize sterols *de novo* as well as utilizing dietary sterols (A. M. MACKIE, Aberdeen).

In contrast to the other main speakers D. J. FAULKNER (La Jolla, USA) spoke on biomimetic synthesis. He discussed ways in which halogen may be introduced to organic compounds and suggested that halogenated cyclic terpenes are formed *in vivo* by bromonium ion-initiated cyclizations. He then went on to describe an *in vitro* synthesis of 10-bromo- α -chamigrene based on that approach.

P. SCHEUER (Honolulu) added a further chapter to the aplysiatoxin story. This compound, and its debromo derivative, elaborated by certain sea hares (gastropod molluscs), are 14-membered dilactones of unusual structure containing a bis-oxaspiro system. New rearrangements under acidic conditions, and the oxidative behaviour of anhydro derivatives were discussed, and it is now possible to make some stereochemical assignments based on p.m.r. data and chemical behaviour.

In the final lecture J. T. BAKER (RRIMP, Dee Why, NSW, Australia) outlined the history of Australian marine natural products research starting from the work of M. D. SUTHERLAND at Brisbane in the late 1950s. He then went on to describe a large amount of unpublished work carried out at RRIMP since April 1974. Many compounds have been isolated and identified which complement those found in marine animals from other parts of the world and provide 'Australian variations' on structures discovered elsewhere. Besides known types, some very novel compounds were reported including a remarkable hexadecahydropyrene di-isonitrile, a cyclic peroxyketal, and a heptadecatetraenylbenzoquinol.

Plenary lectures presented at the Symposium have been published in the IUPAC Journal *Pure and Applied Chemistry*, Vol. 48, No. 1 (1976) and as a separate Symposium volume by Pergamon Press Ltd., Oxford, UK.

R. H. THOMSON

INTERNATIONAL ROUND TABLE ON STUDY AND APPLICATIONS OF TRANSPORT PHENOMENA IN THERMAL PLASMAS

Font-Romeu, 12-16 September 1975

The meeting was held at Laboratoire des Ultra-Refractaires du CNRS, Odeillo, France, under the sponsorship of IUPAC and CNRS. Thanks are due to the following French organizations for their financial

assistance: Centre National de la Recherche Scientifique, Electricité de France, Conseil Général des Pyrénées Orientales, and Municipalité de Font-Romeu-Odeillo-Via. The Organizing Committee consisted of 6 members with Dr. M. FOEX (France) as Chairman, Dr. C. BONET (France) as Editor: the other 4 members were the Organizers of Sessions and their names are given under the Session which they organized.

About 80 participants attended the Round Table from various countries: Australia, Austria, Belgium, Canada, France, Germany, Italy, Japan, Lebanon, Niger, Nigeria, Poland, South Africa, Sweden, Switzerland, UK, USA and USSR. The programme was distributed over 4 Sessions (one per day), with one invited lecture opening each daily session:

Session I: Large Scale Plasma Heating, Organizer and Animator J. MILLET (France) had for its invited speaker Dr. P. H. WILKS (USA) who spoke on 'The Current State and Future Directions of Industrial Plasma Chemistry'.

Session II: Heat Transfer to Condensed Phases, Organizer and Animator Dr. J. LAWTON (UK). The invited speaker Prof. E. PFENDER (USA) gave a lecture on 'Heat Transfer from Thermal Plasmas to Neighboring Walls or Electrodes'.

Session III: Simultaneous Heat and Mass Transfer, Organizer and Animator Dr. W. H. GAUVIN (Canada). The invited lecture entitled 'Heat and Mass Transfer in Plasma Systems' was presented by Dr. I. G. SAYCE (UK).

Session IV: Simultaneous Heat and Momentum Transfer, Organizer and Animator Dr. B. WALDIE (UK). The invited lecture entitled 'Plasma Spraying' was presented by Prof. N. N. RYKALIN (USSR).

The invited lectures have been published in the IUPAC journal *Pure and Applied Chemistry*, Vol. 48, No. 2 (1976). Combined with the 4 invited lectures from the International Symposium on Plasma Chemistry (Rome, 18-23 September 1975) a book edition will also be published by Pergamon Press, Oxford.

About 36 contributions were also presented, dealing with the various topics defined in each session. A lot of time was devoted to discussions either after each contribution or at the end of each session. The major points discussed were:

- what is the future of plasma chemistry applications?
- which new applications are worthwhile being considered?
- prediction of transport phenomena (measurements, calculations, modelling).

Some elemental answers were given to these various problems and the meeting was an excellent occasion to gather for better understanding between people from industry and researchers from university and government laboratories.

C. BONET

XVIII COLLOQUIUM SPECTROSCOPICUM INTERNATIONALE

Grenoble, 15-19 September 1975

Organized by the French Groupement pour l'Avancement des Méthodes Spectroscopiques et Physicochimiques d'Analyse (GAMS), the Colloquium was held at Grenoble (France) under the sponsorship of IUPAC, of the French Ministry of Education, of the Atomic Energy Commission and of different other scientific and industrial French organizations. Approximately 600 persons were registered, coming from 36 countries and the five continents, but most of them were Europeans. The French participation did not amount to more than 44% of the total.

The Colloquium was placed under the honorary chairmanship of Prof. L. NEEL, a Nobel Laureate in Physics and benefitted by the presence of another Nobel Laureate in Physics, Prof. R. L. MÖSSBAUER who chaired a plenary lecture by Prof. C. JANOT on 'Applications of Mössbauer Effect to the Solid State Physics and Technology' and that of Dr. E. LOEUILLE, 'the founder of the Colloquium'. The first CSI organized by Dr. LOEUILLE and GAMS actually took place in Strasbourg in 1950, and the Grenoble meeting (XVIII CSI) celebrated the twenty-fifth anniversary of its foundation.

The opening session was chaired by Prof. NEEL who welcomed the participants and introduced the city of Grenoble as the main scientific centre of the French Alps. The high calibre of research teams and equipment at the university made it possible to hold the Colloquium in satisfactory conditions on the Grenoble Campus at Saint Martin d'Hères.

On behalf of Sir Harold W. THOMPSON, President of IUPAC, the Chairman of the IUPAC Commission on Spectrochemical and Other Optical Procedures for Analysis, Dr. L. S. BIRKS, briefly expressed the best wishes of IUPAC for a successful Colloquium. Then he gave his remarkable plenary lecture on 'Current Capabilities and

Future Goals in X-Ray Spectroscopy'. The other plenary lectures, all of a high scientific level, were given by:

Prof. M. SOUTIF on 'Recent Improvements in Instrumental Spectroscopy'

Prof. K. SIEGBAHN on 'Electron Spectroscopy and Molecular Structure'

Prof. W. VOELTER on 'New Aspects in Structure Elucidation of Natural Products'

Dr. E. PLSKO on 'The Spectrochemical Properties of Some Light Sources'

Dr. D. N. KRAMER on 'Design of Fluorometric Analytical Methods'.

There were also five specialized guest lecturers:

Dr. V. G. KOLOSHNIKOV (replaced by Prof. MANDELSHTAMM)—Quantitative Measurement of Small Absorption Coefficients in the Intracavity Absorption Spectroscopy Method using C W Dye Laser.

Dr. J. ROMAND and B. VODAR—Recent Improvements and Possible Uses of Far u.v. Spectroscopy

Mr. H. LAURENT—Toward a Community Bureau of Standards

Mr. M. MARSCHAL—Standard Materials of the Bureau National de Métrologie

Mr. LEGRAND—Circular Dichroism and its Application in Organic Chemistry

The three official languages of the CSI were English, German and French. All the plenary and guest lectures and some other presentations were organized in the 'Amphitheatre Louis Weil' and were translated into two languages. The rest of the papers were read in other rooms but not translated. 142 papers were actually presented. They were grouped in short sessions of 3-6 papers, as many as possible on the same subject (or on neighbouring ones) so as to facilitate discussions. The following specialized sessions were held:

- (i) X-ray Spectroscopy: 4 sessions
- (ii) ESCA, X-ray and γ -ray Spectroscopy: 2 sessions
- (iii) Use of Laser in Different Kinds of Spectroscopic Methods: 2 sessions
- (iv) Mass Spectrometry: 3 sessions
- (v) Atomic Absorption Spectrometry: 4 sessions
- (vi) Molecular Spectroscopy: 8 sessions
- (vii) Emission Spectroscopy: 8 sessions
- (viii) Instrumentation: 4 sessions

The papers on instrumentation were supplemented by short papers of manufacturers during the last two days of the Colloquium and associated with an exhibition of scientific instruments where 41 companies could display their equipment on 1800 m².

The sessions on X-ray and electron spectroscopy, on lasers, on mass spectrometry, on inductively coupled plasma in optical emission spectroscopy (ICP-OES) and on arc spectroscopy were particularly successful and arose great interest among the audience. The molecular spectroscopy session was not so crowded even for the session devoted to circular dichroism, which was a new topic of CSI.

Panel (Round Table) discussions were organized on topics where several techniques could be used concurrently with the hope that fruitful discussions take place between specialists of different fields. The different themes were:

- A—Interaction in Flameless Atomic Absorption (Chairman: Prof. DAWSON)
- B—Application of Molecular Spectroscopy to Determination of Organic Structures (Chairman: Dr. LEICKNAM)
- C—Analysis of Surfaces (Chairman: Dr. BAUDIN)
- D—Trace Analysis in Mineral and Geological Samples (Chairman: Dr. RUBESKA)

An informal supplementary 'round table' was also organized on ICP-OES (organizer: Prof. ROBIN); it revealed the interest raised by this new and rapidly developing technique and led the audience and organizers to wish that the topic be 'formally' discussed during a forthcoming Colloquium. A report on these Panel discussions is being prepared and will be published in *Analusis* (Paris, Masson).

All the participants in the CSI were given three booklets (over 1000 pages) with summaries of the plenary and session lectures; detailed texts of the plenary lectures have been published in *Pure and Applied Chemistry* (the IUPAC Journal) and as separate colloquium volume by Pergamon Press, Oxford.

During the colloquium several visits to industries in and around Grenoble were arranged: Société Alsthom-Neyrpic (electrical instruments), Société Télémécanique Electrique (electrical and electronic instruments and computers), Pechiney Research Centre on Aluminium, Nuclear Research Centre of Grenoble and International Institute Max von Laue-Paul Langevin (high-flux nuclear reactor).

Last but not least, this austere scientific program was pleasantly completed by two receptions at the Prefecture and the Town Hall of Grenoble, one tour in the Belledonne mountains (Chamrousse and

Allevard) and the traditional banquet followed by folk dances and floor-dancing. The ladies program was a great success.

During the closing session some announcements were made: forthcoming meetings decided by the National Delegates, invitations confirmed by the next Presidents present in Grenoble:

- XIX CSI will be held in Philadelphia (USA): 15-19 November 1976
- XX CSI in Prague (Czechoslovakia): 30 August - 7 September 1977
- XXI CSI in Cambridge (UK) in 1979 (the dates to be announced in due course).

J. P. ROBIN

INTERNATIONAL CONFERENCE ON COLLOID AND SURFACE SCIENCE

Budapest, 15 - 20 September 1975

This IUPAC-sponsored meeting was organized by the Hungarian Chemical Society jointly with the Commission on Colloid Chemistry of the Hungarian Academy of Sciences, and with the collaboration of Department of Colloid Science of the Loránd Eötvös University, Budapest.

The Conference was attended by about 270 participants from 24 countries. The Conference opened with the chamber orchestra performance of 'Colloids' by the Hungarian composer ZSOLT DURKÓ in the ceremonial hall of the Hungarian Academy of Sciences. Prof. T. ERDEY-GRUZ, President of the Academy and Honorary President of the Conference, in his opening speech emphasized the ever growing importance of colloid and surface chemistry in almost all branches of science and industry. Prof. SCHAY, Chairman of the Conference, outlined in his opening address that the main intention of the organizers was to bring together as many colloid and surface chemists from as many countries as possible. Therefore, no special topic had been selected, and reports of both academic and applied research areas were accepted for presentation. Prof. B. LENGYEL (Hungary) pointed out that the Academy paid special attention to this branch of science which had a long tradition in Hungary. Dr. K. J. MYSELS (Chairman, Commission on Colloid and Surface Chemistry of IUPAC) gave a brief outline of the activities of IUPAC, and on its behalf welcomed the participants.

Twenty-eight invited lectures and 96 contributed papers were presented at the Conference. In addition, one session was reserved for free communications to be submitted during the Conference, and some 7 participants made use of this offer. Fourteen invited lectures have been published in the IUPAC journal *Pure and Applied Chemistry*, Vol. 48, No. 4 (1976), and as a separate 'Conference Volume' by Pergamon Press, Oxford. The preprints of contributed papers were published by the Publishing House of the Hungarian Academy of Sciences before the Conference, and all registered participants got the 776 page volume free-of-charge. A supplementary volume comprising 'Discussions' is in preparation.

In his plenary lecture, Prof. B. V. DERJAGUIN (USSR) gave a survey on the role that interparticle forces play in colloid stability. The importance of the disjoining pressure acting in thin interlayers between particles was particularly stressed. He reported some new results on the kinetics and mechanism of the slow coagulation using the flow-ultramicroscope technique. The other plenary lecture was given by Prof. G. SCHAY (Hungary) who presented a common general framework of thermodynamic relations between interfacial excess quantities in multicomponent systems, and showed how the general relations may be applied to L/G as well as to S/G and S/L interfaces without any use of the controversial concept of the surface tension of the solid.

Some other lectures also dealt with adsorption thermodynamics. Prof. D. H. EVERETT (UK) developed a unifying thermodynamic framework within which the effects of adsorption on the interaction between solid particles immersed in a gaseous, pure liquid or solution environment can be discussed. Prof. R. J. GOOD (USA) presented a rigorous mathematical treatment using the concept of the Gibbsian dividing surface, and the surface of tension, respectively, for both contact angle systems and those containing fluid phases only. In systems of the latter type, the three surfaces of tension must be confluent at the line of tension, and in the neighbourhood of that line, it may be impossible for the surfaces of tension to be even approximately planar.

Prof. R. S. HANSEN (USA) analysed surface equations of state in adsorption of polar organic compounds at the mercury/electrolytic solution interface using high precision electrocapillary and double layer capacity data as test data and the Frumkin and Flory - Huggins equations as test equations. Using parametrization for getting best fits some physically unrealistic results were obtained. Prof. J.

LYKLEMA (Netherlands) investigated how organic admixtures affect the stability of AgI hydrosols by influencing the relative dielectric constant of the medium, or, on the other hand, the Stern potential. He concluded that some drastic modifications of the DLVO-theory were required to account for experimental data.

Prof. E. MATIJEVIC (USA) gave an excellent survey on the methods for preparation of exceedingly monodisperse and monoform metal hydrous oxide sols. Anions play a decisive role in the particle formation, and both the size and the shape or morphology of the particles may be varied in a very sensitive manner by altering the experimental conditions. Prof. S. BRUNAUER (USA) described a method of how the pore structure of solids containing both micro- and mesopores may be determined from adsorption isotherms without assumptions as to the pore geometry.

Prof. M. M. DUBININ (USSR) applied the X-ray technique for analysing the nature of mass transfer of X-ray-contrast substances on their adsorption in pellets of microporous adsorbents like active carbon and moulded zeolite. The adsorption kinetics can be described satisfactorily only by assuming a biporous structure model with the use of which the diffusion coefficients may be calculated separately for adsorbing (i.e. micro- and 'supermicro'-) pores and transport (i.e. meso- and macro-) pores.

Prof. G. D. PARFITT (UK) reviewed the present status of the chemistry of oxide surfaces emphasizing that the surface behaviour of oxide powders, especially the concentration and distribution of hydroxyl groups on the surface, governs in many cases their applicability as pigments and catalysts. He particularly focussed attention to information that can be obtained by spectroscopic and electrokinetic methods. Prof. A. C. ZETTLEMOYER (USA) gave a very interesting account of how the treatment with organosilanes of fully and partially hydroxylated silicas influences their surface properties as the water susceptibility of the different functional groups and the availability to water of any residual hydroxyl groups.

Prof. A. WEISS (Federal Republic of Germany) dealt with phase transitions occurring upon heating in bilayers of long n-alkyl chain surfactants and glycerides that are supported by lamellar particles of clay minerals. Stepwise changes in the bilayer thickness were observed that are dependent upon the length and conformation of the chains, their packing density, the latter being affected by the structure and symmetry of the supporting surfaces. At higher temperatures a transition from alpha to beta phases takes place which is connected with a

decrease in both the packing density and the layer thickness. All the phase transitions are very sensitive to chain-branching and to *cis*- or *trans*-double bonds present in the bilayers.

Dr. J. F. PADDAY (UK) summarized our present knowledge on meniscus properties, mainly on the equilibrium and stability conditions for axially symmetric menisci like pendant and sessile drops, captive and emerging bubbles, and liquid bridges. Special attention was paid to the behaviour under dynamic conditions that are important by surface tension measurements, by studying the breakdown of liquid bridges, etc. Some approximation procedures for computing meniscus profiles were presented as well.

Prof. H. VAN OLPHEN (USA) pointed out that the short range interaction (up to about 1 nm) between clay and water does affect the structure of water adsorbed on the surface of the plate like clay particles as is shown by the evaluation of the adsorption entropy and from i.r. and n.m.r. studies. Results of theoretical investigations may be applied directly in diverse technical and technological fields.

Dr. K. J. MYSELS (USA) gave a very clear picture on the present status of soap films both from an experimental and a theoretical point of view. He stressed the importance of studying the short-lived thickened region ('aureole') that forms upon perforating a soap film as it contains information about the surface pressure to area per molecule relation and hence about interaction forces. The main result is that attractive forces become increasingly important at very low areas per molecule even in ionic monolayers, and that desorption from such monolayers is unexpectedly slow.

Prof. B. TAMAMUSHI (Japan) and Prof. S. FRIBERG (Sweden) presented new experimental material for ternary systems consisting of water, a surfactant and another amphiphilic compound otherwise insoluble in water, like long n-alkyl chain alcohols. The former author has reconsidered the surface tension and viscosity anomalies found by these systems from the classical point of view due to Wolfgang Ostwald, i.e. that they are able to form 'lyotropic' and 'thermotropic' mesomorph phases ('mesophases'), while the latter one focussed attention on those concentration regions where liquid crystalline phases and macroscopically homogeneous microemulsions are present. Surfactant systems, too, were the subject matter of the lectures of Prof. K. SHINODA (Japan) and Prof. I. DANIELSSON (Finland).

Prof. B. TEZAK (Yugoslavia) dealt with the factors governing the kinetics and mechanism of formation of precipitates from aqueous electrolytic solutions. He emphasized the importance of the 'methoric

layer', i.e. the heterogeneous transition regime of very complex nature between the particles of the new phase and the homogeneous bulk solution phase, and stressed the intimate connection of precipitate formation to colloid stability.

Prof. A. VRIG (Netherlands) presented a general statistical thermodynamical approach of how to treat the interaction of particles of any kind in a liquid medium, in particular the interaction of polymers with dispersions, taking volume restriction and osmotic pressure effects into account. The analysis includes a very broad spectrum of systems with entirely different kinetic units like rigid particles, polymer colloids of a high segment density, random coils, and so on. A number of experimental facts supporting the theory were presented, e.g. creaming rate of latex, flocculation of sterically stabilized latex, and microemulsion with added polymer.

It is, of course, not possible to account for all contributions in detail here, not even for all main papers, e.g. for those given by Prof. M. MIRNIK (Yugoslavia), Prof. E. D. SHCHUKIN (USSR), Prof. H. SONNTAG (GDR), Prof. A. SANFELD (Belgium), Prof. Y. TAMAI (Japan) and Dr. L. TER-MINASSIAN SARAGA (France). The interest in the Conference and the level of the presentations can perhaps be characterized by the fact that one finds even among the authors of contributed papers such authorities as Prof. M. L. HUGGINS (USA), Prof. F. M. FOWKES (USA), Prof. S. G. MASON (USA), Prof. H. LEIDHEISER (USA), Prof. K. MEGURO (Japan), Prof. D. A. FRIDRIKHSBERG (USSR), and many others.

The Conference was not expected to be the place for announcing any dramatically new development in one field or another but everyone who attended the meeting considered it useful—for the participants were able to get a general idea of what was going on in the broad area of colloids and surfaces, to learn some new techniques, to discuss with colleagues so far known from literature only. Prof. EVERETT rightly said in his toast that the meeting offered a unique opportunity for 'coagulating' people working in the field who are otherwise 'dispersed' all over the world.

E. WOLFRAM

INTERNATIONAL SYMPOSIUM ON PLASMA CHEMISTRY

Rome, 18 - 23 September 1975

The Symposium was held in Rome, Italy, at the headquarters of the Italian Consiglio Nazionale delle Ricerche. In addition to providing a

very comfortable lecture hall the Consiglio contributed generously to the financial support of the meeting. About 100 delegates attended the meeting representing Australia, Austria, Belgium, Canada, Federal Republic of Germany, France, German Democratic Republic, Hungary, Israel, Italy, Japan, Nigeria, Poland, South Africa, Switzerland, UK, USA, USSR, and Yugoslavia. The technical part of the meeting consisted of 4 invited papers, 59 contributed papers, and a panel discussion. The invited lectures have been published in the IUPAC journal *Pure and Applied Chemistry*, Vol. 48, No. 2 (1976). Combined with the 4 invited lectures from the International Round Table on Study and Applications of Transport Phenomena in Thermal Plasmas (Font-Romeu, 12 - 16 September 1975) a book edition will also be published by Pergamon Press.

Since the schedule of sessions was planned to span across a week-end, ample time was available to sample the sights and pleasures of Rome. This feature of the meeting was thoroughly enjoyed by all of the delegates. Another delight of the meeting was the dinner planned by Prof. E. MOLINARI (University of Rome) for the last evening of the meeting. This gathering was quite lively and lasted into the early morning hours.

On the first day of the Symposium the delegates were welcomed by Prof. E. MOLINARI, Chairman of the Program Committee and by Prof. H. SUHR (University of Tübingen, Federal Republic of Germany), Chairman of the IUPAC Subcommittee on Plasma Chemistry.

The first session, on elementary reactions in plasmas, was introduced by Dr. A. FONTIJN (AeroChem Research Labs., New Jersey, USA). An invited paper was presented by Dr. H. W. DRAWIN (Association Euratom, Fontenay-aux-Roses, France) concerning elementary reactions and the interpretation of measurements of Chemically reacting non-L.T.E. plasmas. The contributed papers comprising the balance of this session dealt with a variety of elementary reaction processes including energy transfer by excited species, chemi-ionization, and ion-molecule reactions.

In a supplementary session following the first session Dr. A. A. IVANOV (Kurchatov Institute of Atomic Energy, Moscow, USSR) gave a perspective view of the developing interest and activities in plasma chemistry at his Institute.

Prof. J. L. DELCROIX (Laboratoire de Physique des Plasma, Orsay, France) introduced the second session on diagnostic techniques in plasma chemistry. An invited paper by Prof. M. KAUFMAN

(Emory University, Georgia, USA) reviewed the use of molecular beam analysis to detect free radicals produced in a plasma. He also described the potential for using discharge 'actinometers' as a means of measuring the intensity of electric discharges. The contributing speakers described a number of techniques which could be used to obtain physical and chemical characterizations of multicomponent plasma-chemical systems. These papers were of particular interest since they touched upon a central problem common to all of plasma chemistry.

The third session was introduced by A. T. BELL (University of California at Berkeley, USA) and dealt with plasma engineering. Prof. N. N. RYKALIN (Academy of Sciences, Moscow, USSR) presented an invited paper outlining the use of large scale plasma generators for metallurgy and the processing of inorganic materials. The contributed papers in this session described a number of applications for high temperature thermal plasmas and the modeling of kinetics in non-equilibrium discharges.

The fourth session was conducted as a panel discussion and was chaired by Dr. C. BONET (Centre National de la Recherche Scientifique, France). The purpose of the discussion was to report on current and future activities in plasma chemistry. Prof. H. SUHR reported on the activities of the Subcommittee of Plasma Chemistry, Dr. Y. L. KHAIT (Solid State Institute, Haifa, Israel) discussed the classification of plasma chemical processes, Dr. C. BONET reported on the activities of the Industrial Liaison Committee, Prof. FAUCHAIS (Universite de Limoge, Limoge, France) discussed the measurement of rotational and vibrational temperatures and the interpretation of electronic emission spectra, and Dr. K. C. LAPWORTH (National Physical Laboratory, Teddington, UK) described the development of temperature standards to be used by researchers working with thermal plasmas.

Prof. H. SUHR introduced the fifth session on chemical reactions under plasma conditions. An invited paper was given by Prof. S. VEPREK (University of Zürich, Switzerland) on heterogeneous reactions in non-isothermal low pressure plasmas. Contributed papers were presented on the subjects of organic and inorganic reactions, the physical characterization of discharges in which reactions are occurring, and plasma polymerization.

At the conclusion of the meeting the delegates agreed that the Symposium had been a success and that it had served to bring together researchers whose interests both overlapped and complimented each

other. It was noted, however, that future meetings should provide opportunities for smaller groups with strong common interests to hold workshops on selected topics. The opportunities for extended discussion of the papers presented in such sessions would be much greater than that available during the general sessions. The Program Committee for the 1977 meeting acknowledged the recommendation and agreed to plan for a number of workshop sessions in addition to general sessions for the next symposium.

A. T. BELL

III INTERNATIONAL SYMPOSIUM ON BIOELECTROCHEMISTRY

Juelich (KFA), 27 - 31 October 1975

For the interdisciplinary field of 'bioelectrochemistry'—a branch of science growing rapidly in significance and interest—the biennially held symposia have become international scientific events to discuss and define the present frontiers and status of research amongst electrochemical and biological experts. The great significance attached to bioelectrochemistry is recognized by the fact that both IUPAC and ISE (International Society of Electrochemistry) sponsored this meeting. More than 120 researchers in the field from all five continents attended the symposium. The scientific programme had been prepared by an international committee [Chairman: Prof. H. W. NÜRNBERG, Director of Institute of Applied Physical Chemistry of the Nuclear Research Centre, Juelich (KFA), FRG]. In the 8 sections, opened by 8 invited plenary lectures, 43 papers were presented—these are in the course of publication in the new periodical *Bioelectrochemistry and Bioenergetics*. Some of the plenary lectures will be published in full in the new monograph series *Topics in Bioelectrochemistry* (G. MILAZZO, ed.) to be published by J. Wiley, New York. The 4th symposium, to be organized by Prof. A. A. PILLA (Columbia University) will be held in New York in 1977.

The first section *Electrochemistry of Low Molecular Substances of Biological Interest* was opened by a plenary lecture of P. ELVING (USA), which reviewed critically the electrochemical behaviour of nitrogen heterocyclic compounds particularly of the nicotinamide, pyrimidine and purine groups. There are differences if these molecules are singular individual entities or building stones of biopolymers (e.g. different deamination rates in the reduction of isolated cytosine and its oligonucleotides). Detailed information on the electrode pro-

cess and the adsorption behaviour of the singular entities are of great significance for a detailed understanding of the interfacial behaviour of corresponding biopolymers. The following two papers by V. VETTERL (Czechoslovakia) and by P. VALENTA, H. W. NÜRNBERG and D. KRZNARIC (FRG) emphasized similarities between compact films of DNA units (bases nucleosides, nucleotides) adsorbed at a charged interface and their behaviour in adsorbed layers of DNA and other biosynthetic polynucleotides with respect to stacking, potential dependent orientation and adsorption area. In addition a number of new results were reported in the paper of VALENTA *et al.* on the systematic study of the interfacial behaviour of adenine mononucleotides including cyclic 3', 5'-AMP. The mechanism leading to the zero current potential of NAD/NADH⁺ has been clarified with modern polarographic methods by P. LEDUC and D. THÉVENOT (France). In the field of bioelectrochemical modelling M. GROSS *et al.* (France) presented their work on synthetic porphyrins which are able to simulate the redox behaviour of natural porphyrin compounds. B. CZROCHALSKA *et al.* (Poland) reported on new results for the reduction of photoadducts of biologically important pyrimidines. T. KUWANA (USA) showed the particular potentialities of spectro-electrochemical approaches to elucidate the kinetics of electron transfer in cytochrome *c* and cytochrome *c* oxidase. J. M. SAVEANT and D. LAXA (France) elucidated by cyclic voltammetry the reduction mechanism of vitamin B₁₂. J. MOIROUX *et al.* (France) studied at a rotating glass - carbon electrode the redox system lipoic/dihydrolipoic acid in aqueous solution.

As an important general conclusion it is to be emphasized that while hitherto the biologically relevant compounds have been considered mainly in the bulk of the solution their surface properties turned out to be even more important—particularly for those substances contained as units in nucleotides and biopolymers. Their reduction occurs usually after prior adsorption and thus with suitable techniques their electrode reaction response can serve as an efficient marker to clarify their interfacial behaviour.

Section II was devoted to *biomolecules and biopolymers*. In the opening plenary lecture H. BERG (GDR) gave a comprehensive survey on the electrochemical behaviour of nucleic acids, proteins and nucleoproteins. B. JANIK (USA), reported on the molecular weight dependence of the polarographic response of reducible and nonreducible polynucleotides and the characteristics of three different conformations of poly-A. G. C. BARKER and D. McKEOWN (UK),

demonstrated the striking possibilities of the new advanced method of modulation polarography for the elucidation of details of the interfacial behaviour of DNA and RNA adsorbed at a charged interface. The essential findings agree well with the results obtained for DNA with advanced single sweep voltammetry by B. MALFOY, J. M. SEQUARIS, P. VALENTA and H. W. NÜRNBERG (FRG). These authors clarified the main contours of the complicated interfacial behaviour of native DNA and elucidated the deconformation stages to be passed before the reduction of adenine and cytosine becomes possible. Adsorption contact is connected with destabilization by local dehydration. Afterwards transformation of the double helix to a linear 'ladder' structure occurs followed by helix unwinding under the constraint of the adsorption forces and the interfacial electric field and accompanied by reorientation of the orientable bases after rupture of the Watson - Crick interstrand base pairing bonds. A further paper by these authors was devoted to the influence of the base composition (percentage of A - T and G - C pairs) and of molecular weight of DNA and polynucleotides of various origin (calf thymus, several bacteria, chicken erythrocyte) on the interfacial properties and reduction of DNA. J. A. REYNAUD (France), investigated the adsorption and reduction of t-RNA phenylalanine. Interesting results on conformational changes (unfolding) of adsorbed globular proteins were reported by F. SCHELLER *et al.* (GDR). For adsorbed haemoproteins electron transfer through the adsorbed layer to further molecules diffusing to the interface was postulated. S. KWEE (Denmark) showed that the electrochemical reduction of the disulphide bond in α -chymotrypsin and trypsin influences the enzyme activity of the reduced species.

The general discussion of this section was focussed on the conformational changes adsorbed biomolecules undergo at charged interfaces and in this context also the reduction of those macromolecules was considered. Attention was drawn to the implications of conformational alterations in the application of electrodes implanted in organisms. With respect to proteins also multilayer adsorption and electron transfer through the adsorbed layer in the reduction of prosthetic groups but not for disulfide bonds are to be taken into account. As a further marker for the interfacial behaviour of proteins the not yet studied oxidation of amino acid units was suggested. Generally comparisons of electric field effects on deconformation of biomolecules in the bulk and at the interface were regarded as of particular interest.

Section III on *bioelectrochemical methodology and instrumentation* was opened by a plenary lecture of M. J. ALLEN (UK), reviewing topics as electrochemical control of growth characteristics of micro-organisms, the direct conversion of photo energy to electric energy in thylakoid suspensions, the study of red blood cell metabolism via the polarographic response of a red blood cell suspension and *in vivo* potentiometry furnishing data on the metabolism of an isolated rabbit heart. F. RAUWEL and D. THÉVENOT (France), presented a number of examples for the amperometric titration of sulfur-containing compounds including proteins with ring-disc electrodes. An improved method for the determination of the membrane resistance of electrically excitable cells having a passive conducting nerve was developed with one intracellular microelectrode by C. KRISCHER and J. VAN DEN BOSCH (FRG). Modern trends in the design of miniaturized selective electrode sensors: enzyme substrate electrodes, liquid membrane electrodes and ion sensitive field effect transistors were outlined by B. FLEET *et al.* (UK). The possibilities to increase the life time of heart pace makers by implanted smooth and porous electrodes were described by M. MUND *et al.* (FRG).

Electrochemical phenomena at membranes was the topic of section IV. H. G. L. COSTER (Australia) discussed in his plenary lecture the conductivity of a membrane using the presumption of positive and negative fixed charge subunits introduced according to pH via protonated amino and via COO-groups embedded in an inert membrane. Excitation characteristics similar to nerves may be induced or steady state characteristics may be exhibited. U. ZIMMERMANN *et al.* (FRG) reported on extended studies of dielectric breakdown of cell membranes due to external electric fields. The method provides not only significant insights in membrane properties but has also important application potentialities for the transfer of compounds through the temporarily more penetrable membrane and the subsequent slow release of formed substance deposits (enzymes, drugs) in living cells and ghost cells. I. R. MILLER *et al.* (Israel) elucidated by a.c.-polarography and cyclic voltammetry the interfacial behaviour of lipid monolayers at a charged interface. The fluctuations were studied with the aid of an added electroactive label (dinitrophenyl). Further, the penetration of polypeptides and oligopeptide hormones was investigated via the reduction of SS bonds. Phosphatidyl choline membranes are readily penetrated while phosphatidyl serine membranes (from bovine spinal cord) formed impenetrable condensed layers. However, there is always adsorption of the poly- and oligopeptides at

the solution side of the adsorbed lipid layer. B. KARVALY (Hungary) presented a new model for the electronic conductivity of membranes based on excitons generating mobile electrons and holes. Further the role of hydration water at the lipid membrane is considered.

Session V was devoted to *ionic transport through cell membranes*. In the plenary lecture, B. LINDEMANN (FRG), showed for the example of Na-uptake by the frog skin epithelium that the first step is rate limiting and is controlled by at least three hormones. The transport is regulated by the opening and closure of channels due to conformational changes as function of membrane potential, i.e. electric field. Certain substances have been identified as stimulators or inhibitors bound to the modifying centres leading to complete prevention of channel closure, as with PCMB or BIG, or permanent closure as the carboxyl blocker carbodiimide. Proton binding to the modifying centres enhances channel closure significantly due to the 'super Na-ion property' of protons.

M. DELMOTTE and J. CHANU (France) studied ion transport through a membrane immobilized with ATP-ase like enzymes. A. P. R. THEVENET and G. W. F. BORST-PAUWELS (Netherlands) showed via the screening influence of polyvalent cations that double layer effects have great significance for the transfer of phosphate and Rb^+ through yeast cell membranes. S. HENIN, D. CRESMASCHI *et al.* (Italy) reported that Na^+ and Cl^- are transported through the rabbit gall bladder epithelium as a neutral couple. H. DROUIN (FRG) studied with the voltage clamp method the electrical activity of Ranvier nodes in myelinated frog nerve fibres as a function of extracellular pH. Specific surface charges due to increased protonation at lower pH result in blocking effects for Na^+ and K^+ while generally the conductance curves for both ions are shifted to more positive membrane potentials. The paper of H. D. LUX (FRG) dealt with the fast determination of K^+ activity during outward currents through the neuronal membrane of helix pomatia employing a specially constructed ion sensitive K^+ microelectrode.

Section VI on *electrochemical functions of cellular systems* was opened by the plenary lecture of Y. A. CHIZMADZCHEV and V. F. PASTUSHENKO (USSR) analysing the Hodgkin-Huxley theory of the excitation of the membrane. As the treatment in terms of rate constants based on Eyring's theory hardly leads to acceptable results a new model was proposed in which channels were considered as a system of strongly interacting subunits. The applicability of this theoretical approach was demonstrated for Na^+ -channels.

N. KRÍŽ *et al.* (Czechoslovakia) measured *in vivo* the kinetics of channel conductance and gating currents for K^+ in mammalian spinal cord with a special K^+ -selective micro electrode. As main source for active re-uptake for accumulated extracellular K^+ discharging neurones are concluded. With various electrochemical methods and by scanning electron microscopy coupled with X-ray spectroscopy N. RAMASAMY and P. N. SAWYER (USA) studied thrombogenesis of prothesis materials and of drugs in the cardiovascular system. *In vitro* and *in vivo* measurements revealed as decisive factor of thrombogenesis the decrease of the negative net charge of blood vessels and erythrocytes. The *in vivo* compatibility of prothesis materials can be improved by electropolishing and electrocleaning.

The second plenary lecture of this section by W. STOECKENIUS (USA) dealt with light absorption of bacterial rhodopsin contained in the purple membrane isolated from halobacteria. Protons are transferred through the protein by a cyclic photoreaction. This light driven photo pump was demonstrated in a model system of light driven ATP synthesis. Simultaneous conformational changes in a chain of proton exchanging groups of the protein provide the pathway for proton transfer through the membrane. H. STIEVE (FRG) reported on critical experiments with the photoreceptor system of invertebrates to elucidate the role of Ca^{2+} and Na^+ on the conductivity of the membrane. This membrane conductivity is controlled for arthropods by a Ca^{2+}/Na^+ binding competition. The influence of counterion fluxes on the kinetics of proton transfer through the thylakoid membrane was studied in the absence of phosphorylating substrates by B. RUMBERG and H. MUHLE (FRG). The function of Ca^{2+} in the excitation and adaptation of the protozoan membrane was examined by E. HILDEBRAND and S. DRYL (FRG).

Session VII on *electrochemical stimulation of cell differentiation* was opened by an elucidating plenary lecture of A. A. PILLA (USA) on electrochemical triggering of biological growth and repair processes. In terms of an impedance model for the membrane including mass transfer of ions via diffusion and migration to the interface and their specific adsorption it was shown that alterations of the external charge represented by the environmental ions as Ca^{2+} stimulate membrane changes and consequently cell differentiation. Laplace plane modelling and data analysis applied in the interpretation of interfacial phenomena at the interface metal electrode/aqueous electrolyte were utilized to get insight into the influences exerted by the adsorption of hormones at special membrane sites, into the regulatory

protein activity of the cell, the functional changes observed for the red blood cells of amphibians and the important orthopaedic application field of bone fracture repair and healing in mammals and man.

S. D. SMITH (USA) studied the effect of static electric charges on the regeneration of amputated forelimbs of adult salamanders. Static charge alterations even of 3 orders of magnitude had no effect as a rapid attainment of a steady state obviously occurs. Electrical stimulation requires not static but rather minute alternating electric fields which influence the rate and/or quality of information transferred into the cell. J. A. SPARADO and R. O. BECKER (USA), reported on effects of electrically injected silver and gold ions important for surgery applications. Thus silver ions injected from silver anodes inhibit significantly bacteria growth without adverse effects on mammalian cells. The released silver ions block at the cell membrane production of bacterial proteins (*E. coli*, *Staphylococcus aureus*) even in strains resistant to antibiotics. Silver anodes have been meanwhile clinically applied with success in the treatment of local bone infections. *In vivo* experiments with rabbits have shown that similar injection of gold ions by small anodic d.c.-currents (μA) might become an effective approach to the treatment of rheumatoid arthritis without toxic side effects. Results suggest that the proliferation of synovial cells and/or their subsequent invasion into the joint surfaces is significantly inhibited.

The last session VIII was devoted to *bioelectrochemical energetics*. In his plenary lecture R. BUVET (France) pointed out that the energetics of biochemical reactions provide a key for the understanding of many important metabolic processes in animals and plants. Based on their energetics metabolic pathways can be systematically treated and classified into a few categories of simple coupled transformations of the involved substances. The most important types are redox reactions, condensation - hydrolysis coupling, and addition - elimination reactions. The overall energy balance and the kinetics of metabolic processes are two main physicochemical aspects of the reasons why two particular reactions are coupled in many metabolic steps. These ideas were used to treat in detail several coupled processes as redox reactions involving a multistep mechanism, intramolecular substitution effects and catalytic effects. J. R. RAO, G. J. RICHTER, F. v. STURM and E. WEIDLICH (FRG) developed a new biofuel cell implantable in tissues which is operated by the oxidation of glucose. Thin and active anodes were prepared from Pt - Ni alloys with the Raney method and a firm bonding to spacers and membranes was

achieved either by condensation of a polyvinyl alcohol/polyacrylic acid mixture or by polymerization in a hydrogel matrix. Such a bio-fuel cell shall be developed for heart pacemakers operated over long times with body inherent energy. J. S. RANWEILER and G. S. WILSON (USA) reported on the spectral and potentiometric behaviour of the haeme peptide HP1-65 from horse heart cytochrome *c*. For this simplest haeme peptide from which a fully active protein can be produced it has been shown that the stability of the Fe - S bond in cytochrome *c* cannot be explained by simple methionine ligation. M. J. ALLEN and A. E. CRANE (UK) applied the new potentiostatic method of null potential voltammetry to study plant photosystems. With this potentiostatic voltammetric technique the potential related to the reduction of biochemical products formed as results of photo-oxidation by photosystem I at the clamped working electrode is measured. U. SIGGEL (FRG) studied the function of plastoquinone as electron and proton carrier in photosynthesis measuring the adsorption changes of chlorophyll- a_1 and of plastoquinone with a repetitive flash technique. The mechanism of plastohydroquinone oxidation coupled with a pH-dependent chlorophyll- a_1 -reduction and the coupled proton pump can be explained with the aid of two models, a fluid and a statistical one. H. METZNER (FRG) gave a lucid presentation of the problem of the still unknown immediate precursor of photosynthetic oxygen. Critical mass spectroscopic measurements with labelled bicarbonate and hydrogen clarified that water cannot be the immediate oxygen precursor although it certainly was identified as the ultimate hydrogen and electron source in photosynthesis.

H. W. NÜRNBERG
P. VALENTA

SYMPOSIUM ON DRUG ACTION AT THE MOLECULAR LEVEL

London, 12 - 13 April 1976

For a number of years, the Biological Council (in UK) has sponsored a series of Symposia on various aspects of drug action. This year's symposium, on Drug Action at the Molecular Level, was the first to be sponsored additionally by IUPAC and the International Union of Pharmacology. It is to be hoped that this will prove to be only the first of a number of joint ventures by these two Unions in areas where

their interests overlap. The Symposium was held at the Middlesex Hospital Medical School in London and was attended by approx. 320 participants. *Proceedings* of the Symposium will be published by Macmillan and Co. Ltd.

The *first session* of the Symposium was devoted to a consideration of the information which can be obtained from studies of the properties of the drug molecule. Dr. C. R. GANELLIN (UK) discussed the use of chemical properties in structure-activity analysis—emphasizing the importance of protonation and tautomeric equilibria in the design of histamine antagonists. Dr. W. G. RICHARDS (UK) described the use of molecular orbital methods to calculate the preferred conformation of and the electron distribution in drug molecules, and discussed the correlation with biological activity, again in histamine analogues. The next presentation by Dr. J. FEENEY (UK), was also concerned with the role of conformation. Dr. FEENEY outlined the information available from n.m.r. spectroscopy on the conformation of peptide hormones, which shows that they are in general conformationally very flexible, and discussed possible mechanisms for the conformational selection which must therefore accompany their interaction with their receptors.

In the *second session*, attention was directed to those drugs whose receptor is a soluble protein, which can thus readily be studied by crystallography and other physical methods. Dr. I. WAARA (Sweden) described the conformation of human carbonic anhydrase (isoenzymes B and C) as revealed by X-ray crystallography, and discussed the geometry of the active site and the binding of sulphonamides and anions, both of which appear to coordinate to the active site Zn(II) atom. The discussion of carbonic anhydrase was continued in the following talk, in which Dr. R. W. KING (UK) described stopped-flow kinetic studies of sulphonamide binding. Studies of a wide range of substituted benzene sulphonamides showed that binding to the enzyme is a two-step process, the second step being a conformational change leading to coordination to the Zn(II), and a proper understanding of the structure-activity relationships could only be achieved if this was taken into account—a point which may have general relevance to drug-receptor interactions.

Dr. P. J. GOODFORD (UK) described a novel approach to drug design, in which compounds were designed to mimic the effects of diphosphoglycerate (DPG) in decreasing the oxygen affinity of haemoglobin not by modifications of the basic DPG structure, but by detailed examination of the structure of the DPG binding site as re-

vealed by the crystallographic studies of Perutz. In this way, compounds were designed which were more active than the natural ligand, DPG, and yet bore little obvious structural relationship to it. Dr. G. C. K. ROBERTS (UK) then described studies of the binding of methotrexate and related compounds to dihydrofolate reductase, using ^1H n.m.r. spectroscopy (including experiments with selectively deuterated enzyme); evidence for conformational changes accompanying drug binding were presented.

The *third session* began with a consideration of drugs affecting nucleic acid replication and protein synthesis. Dr. N. C. BROWN (USA) described studies of a series of 6-aryloxy-pyrimidines; these compounds, after conversion to the active, hydrazino form, specifically inhibit the DNA polymerase III of Gram-positive bacteria, apparently by mimicking the hydrogen-bonding scheme of natural purine nucleotides. Dr. M. J. WARING (UK) discussed two quinoxaline-containing antibiotics, triostin and echinomycin. These are cyclic peptides, each containing two quinoxaline chromophores, and bind to double-stranded DNA by simultaneous intercalation of both chromophores; this is the first example of naturally occurring compounds which show bifunctional intercalation. Chloramphenicol has been known for some while to inhibit protein synthesis on the ribosome, and Dr. O. PONGS (Germany/UK) described a careful series of experiments designed to establish its precise site of action, using the analogue iodoamphenicol as an affinity label.

Dr. V. ULLRICH (Germany) gave a very lucid description of the characteristics of the cytochrome P-450 mixed function oxygenase drug-metabolizing system, emphasizing the evidence for the existence of several different species of P-450 of different specificity, a finding of considerable potential significance.

The *final session* was concerned with receptors located in the cell membrane. Dr. T. TOBIN (USA) discussed studies of the inhibition of the sodium pump (the $\text{Na}^+ + \text{K}^+$ -ATPase) by ouabain and casaine, describing experiments showing that the drugs bind to the phosphorylated intermediate in the reaction cycle, and using species differences in the properties of the enzyme to investigate the relationship between the binding and the inotropic effects of the drugs. Dr. C. LONDOS (USA) described recent work on the glucagon-sensitive adenylate cyclase which has revealed the considerable complexity of the system, metal ions, guanine nucleotides and adenosine (in addition to the hormone) being powerful activators or inhibitors. Despite this complexity, there are indications that a detailed understanding of this

system is not too far in the future. Finally, Dr. E. A. BARNARD (USA/UK) described his investigations of the nicotinic acetylcholine receptor of skeletal muscle. He showed that the receptor is localized in the 'crests' of the folds in the post-synaptic membrane, described the purification and solubilization of the receptor, and compared the ligand binding properties of the intact and isolated receptor.

G. C. K. ROBERTS

II IUPAC CONFERENCE ON PHOTOCHEMICAL PROCESSES IN POLYMER CHEMISTRY

Leuven, 2 - 4 June 1976

On the occasion of the 55th anniversary of the University of Leuven an international symposium was organized from 2 - 4 June 1976 on Photochemical Processes in Polymer Chemistry under the auspices of IUPAC. Prof. C. G. OVERBERGER, Chairman of Macromolecular Division of IUPAC declared the meeting open. Prof. G. SMETS, Chairman of the Symposium and Vice-president of IUPAC, welcomed the participants and presided over the meeting on the first morning.

Prof. TURRO (USA) presented a plenary lecture on energy transfer while Prof. LEDWITH (UK) dealt with the problem of photo-initiation. The afternoon sessions of lectures on photopolymerization by Prof. WEGNER (FRG), and on mechanisms of photoconductivity in polymers by Dr. PEARSON (USA) were presided over by Prof. SCHNABEL and Dr. KLÖPFER respectively. Photophysical processes in polymers were the topics of lectures by Prof. FAURE (France) and Prof. GEUSKENS (Belgium); these sessions were presided over by Prof. DE SCHRYVER, Secretary of the symposium. A relationship between photooxidation and degradation of polymers was brought to the attention by Dr. WINSLOW (USA) (Dr. C. DAVID, chairman). On the last day of the symposium photochemical processes in biopolymers were discussed by Prof. ELAD (Israel). The photochemical transformation of polymers (Prof. KRYSZEWSKI, Poland) and the relation with image formation (Dr. WILLIAMS, USA) were the points of discussion of the closing session under the direction of Dr. DELZENNE. Most of these lectures will be published in 1977 in an issue of the IUPAC journal *Pure and Applied*

Chemistry, and as a separate conference volume by Pergamon Press, Oxford.

The Chairman of the Symposium thanked at the end the participants for their active contribution to the success of the meeting.

G. SMETS

INTERNATIONAL CONFERENCE ON COLLOIDS AND SURFACES

San Juan, Puerto Rico, 21 - 25 June 1976

This IUPAC-sponsored Conference celebrated the occasion of the 50th anniversary of the Division of Colloid and Surface Chemistry of the American Chemical Society and the 50th Colloid and Surface Science Symposium. It was held at El San Juan Hotel in San Juan, Puerto Rico, USA. The meeting was attended by 476 participants of whom 83 came from overseas and 24 from Canada. The breakdown among countries was as follows: Australia (5), Austria (1), Belgium (5), Canada (24), Denmark (1), Finland (1), France (9), FRG (10), Hungary (1), India (3), Iran (1), Israel (3), Japan (8), Netherlands (8), Poland (1), Sudan (1), Sweden (5), Switzerland (3), UK (14), USA (369), Yugoslavia (3).

The programme included three categories of papers. There were 10 plenary lectures as follows:

S. G. MASON (USA)

Orthokinetic Phenomena in
Disperse Systems

A. SANFELD (Belgium)

Surface Thermodynamics

R. L. BURWELL (USA)

The Adsorptions and Reactions of Hydrogen and Deuterium on Chromium Oxide Catalysis at Low Temperatures

M. KERKER (USA)

Some Recent Reflections on
Light Scattering by Particles

K. KLEIR (USA)

Water at Interfaces: Molecular Structure and Dynamics

R. H. OTTEWILL (UK)

Stability and Instability in Disperse Systems

G. SOMORJAI (USA)

Molecular Processes at Solid Surfaces

J. F. DANIELLI (USA)

The Development of Concepts
of Cell Membrane Structure
The Structure and Properties
of the Liquid Crystalline State
Surface Forces and Surface
Interactions

G. H. BROWN (USA)

D. TABOR (UK)

221 contributed papers covering the following topics were also presented: Adsorption, catalysis and solid surfaces; Hydrosols; Surfactants; Aerosols, emulsions; Biocolloids, polymers, monolayers and membranes; Rheology, wetting, surface tension and water; General.

A banquet was held on 24 June at which A. C. ZETTLEMOYER gave a lecture on 'Fun and Foibles of the Fraternity' and on this occasion the 7th Victor K. LaMer Award was presented to F. HONG.

The plenary and invited lectures will be published in the January - March 1977 issues of the *Journal of Colloid and Interface Science* and then will appear as a separate volume published by Academic Press. This volume will also include a scientific overview written by A. M. SCHWARTZ as well as some historical material. Editors will be M. KERKER, R. L. ROWELL, and A. C. ZETTLEMOYER. The contributed papers will be published by Academic Press in four volumes as prepared from camera-ready copy. Editor for these volumes is M. KERKER.

M. KERKER

VI INTERNATIONAL CONGRESS ON CATALYSIS

London, 12 - 16 July 1976

The Congress was held at the Imperial College of Science and Technology, South Kensington, London, under the sponsorship of the Chemical Society and IUPAC.

The total number attending the Congress was slightly under 1300; of these about 300 were accompanying members. Forty-one countries were represented, those sending the largest numbers of participants being the UK, USA, and France. It was particularly encouraging to note that African, South American, Latin American and South East Asian countries are showing a growing interest in catalytic chemistry and it is to be hoped that this trend will continue. The following plenary lectures were presented:

M. BOUDART (USA)

Effects of surface structure on
catalytic activity

G. F. FROMENT (Belgium)	Kinetics of catalyst deactivation by coke deposition
V. B. KAZANSKY (USSR)	Spectroscopic investigation of oxide surfaces and their interaction with adsorbed molecules
F. C. TOMPKINS (UK)	Surface physics and catalytic processes
J. J. VILLAFRANCA (USA)	Structure of metallo-enzyme active sites and their relationship to function

In contrast with the preceding Congress which had a single theme the organizers delineated several themes or areas, within the general fields of heterogeneous catalysis and chemical engineering, in which papers would be particularly welcome. These were

- (i) Catalytic activity and surface topography, to include chemical bonding and surface coordination, particle size, and the effects of atoms neighbouring the active site.
- (ii) Catalyst preparation and characterization, to include decay, ageing and regeneration, interaction of catalyst components.
- (iii) Reactors and modelling of catalytic reactions, to include transport processes, optimization, stability of catalysts and new experimental reactor configurations.
- (iv) Surface composition of reacting systems, to include new techniques and theoretical calculations to reveal the nature of intermediates and excited states.
- (v) Organic and metallo - organic catalysts, to include immobilized enzymes and supported complexes.
- (vi) Two component systems as selective catalysts, to include alloys, binary oxides, etc. and similar supported catalysts.
- (vii) Asymmetric catalysis and stereospecific catalysis to include hydrogenation and polymerization.
- (viii) Hydrocracking, hydroforming and hydrodesulphurization, to include pure and applied aspects.
- (ix) Applications of catalysis to problems of current industrial importance.

The response to the call for abstracts was exceptionally good, 326 being received. After examination by two independent referees 130 papers were commissioned and, after further refereeing, 102 papers were selected for presentation at the Congress. Authors who had been

invited to submit a paper on the basis of their abstract and had subsequently not had the paper accepted were given the opportunity to present their work at poster sessions.

The presentation of papers in two parallel sessions was arranged so that, where possible, discussion could take place on a group of two or three related papers. This ensured a lively participation from the floor and, as so often is the case, time available for discussion tended to be rather too short.

The full proceedings of the Congress, including the discussion and plenary lectures, will be published by the Chemical Society early in 1977.

All attending the Congress are indebted to the twenty-five organizations which so generously gave financial support. This ensured that participants were not restricted to meeting during the formal sessions but also had the opportunity to continue their deliberations during evening social functions at the Geological Museum, Imperial College, the Royal Garden Hotel and the House of Commons.

The meeting was closed by Prof. G. K. BORESKOV, retiring President of the International Congress on Catalysis, who thanked the organizers and announced the names of the new officers and the decision that the Seventh Congress would be held in Japan in 1980.

D. A. WHAN
C. KEMBALL

**1976 PRAGUE MEETINGS ON
MACROMOLECULES
12 - 16 July 1976**

The 16th Microsymposium and 5th Discussion Conference on Macromolecules were held at the same time (12 - 16 July) and place (Technical University, Prague), with programmes correlated without coincidence of invited lectures. About 200 active participants from 19 countries were present at these meetings.

The microsymposium 'Advances in Scattering Methods' was the first in the new series of the 'Method as a Tool'—microsymposia intended for reviewing recent advances and stimulating further progress in a discipline representing scientific tool for macromolecular research.

Contributions presented at the microsymposium were in the following areas: (a) Small angle neutron, X-ray and light scattering; (b) Classical light scattering by small and large particles; (c) Spectroscopy of light scattering. Ten main lectures were scheduled in the microsymposium programme:

H. BENOIT (France)	New results on polymer conformation by neutron low angle scattering (opening lecture)
R. RULAND (FRG)	Density fluctuations in amorphous and semicrystalline polymers
R. S. STEIN (USA)	Recent studies of light scattering from polymer films
M. B. HUGLIN (UK)	Recent trends in classical light scattering from polymer solutions
J. P. KRATOHVIL (USA)	Scattering of light by non-spherical and aggregated colloid particles
G. B. BENEDEK (USA)	Optical mixing spectroscopy and the spectrum of light scattered from solution of biological macromolecules
B. CHU (USA)	Advances in light scattering spectroscopy
I. L. FABELINSKII (USSR)	Stimulated light scattering spectroscopy
I. N. SERDYUK (USSR)	Joint use of light, X-ray and neutron scattering for investigation of the structure of two-component macromolecules in solution
W. HELLER (USA)	Flow light scattering

Unfortunately, Prof. I. L. FABELINSKII and Dr. I. N. SERDYUK were not able to attend the microsymposium and to present their lectures. Five main lectures will be published in 1977 in an issue of the IUPAC journal *Pure and Applied Chemistry*.

The participants showed keen interest in the main lectures. Comprehensive discussion contributions presented at panel discussions related to the three topical areas. Also the majority of nearly 50 contributed papers presented as short communications or as poster contributions had very good response from the audience. About 50% of the contributed papers will appear in the *Journal of Polymer Science, Part C—Polymer Symposia*.

The 5th Discussion Conference 'Phases and Interfaces in Macromolecular Systems' dealt with two topics: (a) Phase behaviour concerning amorphous and mesomorphic phases; (b) Interfacial phenomena. Topical problems were introduced by 14 invited lectures and discussed in nine panel discussion sessions.

Four lectures of the Discussion Conference dealt with the topical problems of phase coexistence in amorphous polymer systems. The fact that in a polymer - solvent system a dilute phase is usually at equilibrium with a concentrated one has recently necessitated a common equation in order to express the thermodynamic behaviour of both dilute and concentrated phases. The problems involved in deriving such equations were examined by Prof. W. H. STOCKMAYER (USA) in the introductory lecture of the Conference. Prof. M. GORDON (UK) in his lecture reported progress in the uses of the pulse-induced critical scattering method (PICS); his talk was mainly focused on the questions of mathematical evaluation of experimentally determined spinodal curves in relation to polydispersity and on the form of concentration dependence of the free energy of mixing. Prof. R. KONINGSVELD (Netherlands) performed thermodynamic analysis of the mutual miscibility of polymers, pointing out the importance of an adequate description of the dependence of the free enthalpy of mixing on concentration and on the molecular weight distribution and confronting the results obtained with the existing molecular theories. Prof. B. A. WOLF (FRG) talked about phase equilibria in a mixture of two oligomers differing in their chemical nature depending on chain length and pressure and about their interpretation in terms of the corresponding states theory.

A number of lectures were devoted to various types of mesomorphic phases. Prof. P. G. de GENNES (France) after having made a general exposé about the properties of various types of liquid crystalline phases outlined possible prospects of an investigation of mesomorphic phases in polymer systems. The existence of a close analogy between classical liquid crystals and organized structures in polymers could also be inferred from the lecture delivered by Dr. J. H. WENDORFF

(FRG), who examined phase transitions in liquid crystals. Prof. D. PATTERSON (Canada) presented results of a thermodynamic and spectroscopic study of changes in the intermolecular order which occur during the mixing of a nematogenic substance with alkanes having different molecular sizes and shape. Dr. D. J. MEIER (USA) explained his statistical-thermodynamic theory of microphase separation and formation of domains in block copolymers, with particular attention to morphological and interfacial aspects. The effect of chain flexibility, thermodynamic interaction and kinetic factors on the formation of mesomorphous phases in block copolymers and polymer mixtures was reported by Prof. S. Ya. FRENKEL (USSR).

The last sequence of lectures was devoted to interfacial phenomena in polymer systems. Prof. Yu. S. LIPATOV (USSR) talked about the structure of phase boundaries in heterogeneous polymer mixtures and its effects on the degree of dispersity in such mixtures. Prof. C. A. J. HOEVE (USA) presented his statistical thermodynamic theory of polymer adsorption on the phase boundary. Prof. E. KILLMANN (FRG) reported the results of experimental determinations of polymer adsorption combined with calorimetric, ellipsometric, and i.r. spectroscopic determinations. Dr. F. T. HESSELINK (Netherlands) explained his theory of the stabilization of colloid dispersions by an adsorbed polymer based on effects of the loss of configurational entropy and on the formation of local osmotic pressure during approaching of two particles.

The lecture by I. PRIGOGINE and R. LEFEVE (Belgium) 'Deterministic and stochastic aspects of dissipative structures' differed from the other lectures in that it was of a more general character; it had as its aim to make the audience acquainted with problems of spontaneous formation of gradients in systems in which chemical reactions and diffusion take place simultaneously.

Besides the 14 invited lectures, almost 40 (announced) discussion contributions (and also numerous *ad hoc* contributions) were presented either within panel discussions or as poster contributions. The acceptance of both invited lectures and other contributions was similar to that mentioned for the microsymposium. About one half of the invited lectures and some papers connected with the respective discussion contributions will be published in *Journal of Polymer Science, Part C—Polymer Symposia*.

At the end of this report, we would like to point out a new form of paper presentation and discussion called 'poster session'. Until now, in macromolecular science, there has not been much experience with

this form. This year at Prague meetings, experience with 'transient' poster form (poster contribution combined with a brief summarizing exposé in plenary session), demonstrated its usefulness and prospectiveness clearly and convincingly.

B. SEDLÁČEK
J. POUCHLÝ

VIII INTERNATIONAL SYMPOSIUM ON CARBOHYDRATE CHEMISTRY

Kyoto, 16 - 20 August 1976

The first International Symposium on Carbohydrate Chemistry was held in London in 1958, and since 1970, the Symposium has been held every two years, alternately in Europe and other areas. The eighth Symposium was held in Kyoto, at Kyoto International Conference Hall, from 16 to 20 August 1976 and was organized by the Science Council of Japan and the Agricultural Chemical Society of Japan, under the sponsorship of the International Steering Committee for Carbohydrate Meetings and IUPAC.

Out of 650 participants, 150 came from abroad, including USA, UK, Federal Republic of Germany (FRG), Sweden, France, Canada, Australia, Austria, Netherlands, South Africa, Poland, Korea, Spain, Belgium, Czechoslovakia, India and Iraq. The opening address by Prof. K. ONODERA, Chairman of the Organizing Committee was followed by a welcome address by Prof. Y. OCHI, President of the Science Council of Japan. Congratulatory message from IUPAC was delivered by Prof. S. ITO, Secretary of the IUPAC Organic Chemistry Division. Prof. W. G. OVEREND of the University of London, also gave congratulatory address.

At the Symposium, ten plenary lectures were delivered by invited speakers, and a total of 180 contributed papers (106 from Japan, 14 from USA, 12 each from FRG and Sweden, 8 from UK, 7 from France, 4 from Canada, 3 from Australia, 2 each from Austria, Netherlands, South Africa, Poland, and 1 each from Spain, Belgium, Czechoslovakia, India and Iraq) were presented in five sessions. It was a regret that all five papers from USSR were cancelled.

The invited speakers were of internationally high reputation and authorities in their respective fields. Titles and speakers of the plenary lectures are as follows:

L. HOUGH (UK)

Recent Aspects of the Chemistry of Disaccharides

B. LINDBERG (Sweden)	Structural Studies of Some Polysaccharides
S. HAKOMORI (USA)	Status of Blood Group H ₃ -Carbohydrate Chain in Ontogeny and Oncogeny
I. J. GOLDSTEIN (USA)	Lectins as Carbohydrate-binding Proteins
G. O. ASPINALL (Canada)	Selective Degradation of Carbohydrate Polymers
E. ATKINS (UK)	Conformation and Molecular Architecture of Polysaccharides
B. COXON (USA)	Fourier Transform NMR Spectroscopy
H. PAULSEN (FRG)	Synthesis of Amino- and Branched Chain Mono- and Oligosaccharides
L. SZABÓ (France)	Structural Features of the <i>Bordetella pertussis</i> Endotoxin
R. L. WHISTLER (USA)	Direction of Carbohydrate Research in the Near Future

All plenary lectures will be published in IUPAC's official journal *Pure and Applied Chemistry* and as a separate Symposium volume by Pergamon Press, Oxford.

Reflecting rapid progress and developments in chemistry and biochemistry of carbohydrates, about 180 contributed papers were presented under the following topics:

(i) Organic and physical chemistry of carbohydrates, which covered synthesis, reaction mechanisms of mono- and oligosaccharides and their derivatives, and conformation and stereochemistry of carbohydrates.

(ii) Polysaccharides, which include starch, glycogen, plant gums and mucilages, seaweed polysaccharides, and microbial polysaccharides, and their chemical and physical structures, biosynthesis and enzymic degradation.

(iii) Complex carbohydrates, which included structure, biosynthesis and biological roles of glycoproteins, mucopolysaccharides, glycolipids, and cell surface carbohydrates.

(iv) Advances in analyses of carbohydrates, which covered recent

developments in chemical and biochemical methods for structural elucidation of oligo- and polysaccharides.

(v) Industrial and medical aspects of carbohydrates, which included unique microbial polysaccharides for medical and industrial application.

Before closing the Symposium, Prof. R. L. WHISTLER, Purdue University, gave a special lecture on recent advances in the chemistry of carbohydrates. He predicted that in the next decade, the major efforts in carbohydrates would be directed towards more biochemical research as well as clinical usefulness. He suggested that polysaccharides would become more important as physiologically active compounds and for industrial utilization.

AKIRA MISAKI

X INTERNATIONAL SYMPOSIUM ON THE CHEMISTRY OF NATURAL PRODUCTS

Dunedin, 23 - 27 August 1976

The venue for the biennial symposium on the Chemistry of Natural Products returned this year to the southern hemisphere for the first time since the initial symposium was held in Australia in 1960. This 10th Symposium was held in New Zealand on the campus of the University of Otago during 23 - 27 August. The 500 delegates, of whom 250 came from 35 overseas countries, were presented with a formidable lecture programme of 13 plenary lectures (to be published in the journal *Pure and Applied Chemistry* and as a separate symposium volume by Pergamon Press, Oxford), 26 half hour lectures and 178 research contributions of which 62 were presented in poster sessions. The programme was arranged in 6 sessions but, although the large lecture programme necessitated the use of concurrent sessions, everyone was able to attend all plenary lectures.

In his presidential address, Sir DEREK BARTON spoke of the use of hypofluorites as positive fluorine reagents for addition reactions to double bonds, aromatic substitution and *N*-fluorination. A reaction of unprecedented regiospecificity which he reported was the electrophilic substitution of tertiary hydrogen by the use of CF_3OF or fluorine to give tertiary fluoro compounds as in 9α and 14α -fluorosteroids.

The complexity of the nucleic acid structures now being elucidated was aptly illustrated by Dr. F. SANGER who gave a very clear exposition of the present state of the art of DNA sequence analysis. This has

progressed to the point where the sequence of the DNA of a small bacteriophage is now virtually completely known. In discussing recent advances in protein sequence analysis Prof. H. D. NIALL (Australia) pointed out that although traditional methods are adequate for work on the micromole level, recent advances using radioisotopic and carrier methodology allow sequencing in the nanomole (10^{-9} M) range. Further refinement is required to solve problems such as the structure of polypeptide hormone receptors. The biosynthetic approach of incorporation of ^{14}C or ^3H labelled amino acids directly into the protein to be studied appears to be a promising line.

Prof. A. R. BATTERSBY (UK) surveyed experiments based on the use of appropriately labelled precursors in conjunction with isolated enzyme systems which afford a detailed understanding of the biosynthesis of the key porphyrin. Special emphasis was laid on the stereochemistry and mechanism of the various enzymatic reactions. Recent researches which should lead to a biosynthetic pathway to vitamin B_{12} were also described. The utility of secondary chemical characters employed in plant systematics were considered in the light of their ecological importance in plant - animal interactions by Prof. J. B. HARBORNE (UK). The increasing number of alkaloids and quinones found in animals were briefly discussed as examples of functional characters which have systematic taxonomic significance. The use of phytoalexin induction as a new dynamic tool in studying plant relationships was described with particular reference to the Leguminosae.

Two plenary lectures in the field of biologically active compounds were presented by Profs. J. MEINWALD (USA) and K. L. RINEHART (USA). The compound pederin isolated from the beetle *Paederus fuscipes* (Nairobi Eye Fly) has received much attention from Prof. MEINWALD who described current efforts at Cornell directed towards its total synthesis. The structure of this intriguing natural product was first established by X-ray crystallography in 1968. Prof. RINEHART described how studies of the biosynthesis of aminocyclitol antibiotics, especially neomycin, led to the development of the mutasynthetic technique for the preparation of related antibiotics. Although not limited to this one area, mutasynthesis has now been used to produce compounds related to essentially all the clinically useful aminocyclitol antibiotics. It is a field which has considerable potential in the study of structural requirements for bioactivity as well as in the design of new antibiotics.

The synthesis of ryanodine, a complex pentacyclic diterpene in a relatively short sequence of reactions has received the attention of

Prof. P. DESLONGCHAMPS (Canada) who described fascinating stereospecific reactions devised to maintain high yields. Diels - Alder reaction of a novel unsymmetrical diene with an optically active dienophile prepared from carvone gave stereospecifically, a tricyclic compound which was then converted in three operations to an optically active pentacyclic system of the desired absolute configuration, truly a brilliant series of reactions. Prof. H. O. HUISMAN (Holland) reported the preparation and use of a highly reactive functionalized isoprene building unit in the synthesis of various isoprenoids. A new approach to the synthesis of vitamin E was also described.

In the first of two excellent plenary lectures in the physical methods section Dr. D. M. DODDRELL (Australia) presented examples illustrating the applicability of nuclear - nuclear dipole relaxation in the determination of molecular microdynamics and solution geometry. The use of spin-rotation relaxation to determine barriers to methyl groups rotations and quadrupole relaxation of deuteriums to probe molecular motion were also discussed. X-ray analysis, the absolute method of structure determination, was used by Dr. I. L. KARLE (USA) to unravel the structure of the potent toxins secreted in the skins of tropical American frogs. She described such compounds as steroidal alkaloids and novel and unusual allenic and acetylenic substituents on spiro ring systems or on *cis*-decahydroquinoline. Studies on cyclic peptides have established the existence of stable multiple conformations, a variety of intramolecular hydrogen bonds and intricate conformational changes upon complexation.

The paper of Prof. P. K. STUMPF (USA) on aspects of fatty acid synthesis was read in his absence by Dr. J. C. HAWKE (NZ). The mechanisms of fatty acid biosynthesis were reviewed in terms of three major advances—the carboxylation of acetyl CoA to malonyl CoA, the recognition of the prime importance of acyl ACP or acyl ACP-like substrates, and the isolation of fatty acid synthetases. These developments have lead to rapid progress in the elucidation of the reactions involved in the formation of fatty acids in both procaryotic and eucaryotic organisms.

In his closing address Lord TODD made an interesting comparison between the status of natural products chemistry today and at the time of the inaugural IUPAC Natural Products Symposium over which he presided in Australia in 1960. He ended on a note of optimism for the future of natural products chemistry.

A. D. CAMPBELL

V INTERNATIONAL CONFERENCE ON SOLID COMPOUNDS OF TRANSITION ELEMENTS

Uppsala, 21 - 25 June 1976

The Conference was held at the premises of Uppsala University. It was sponsored by IUPAC; IUPAP; European Physical Society; Swedish National Committees for Chemistry, for Crystallography, and for Physics; Swedish Natural Science Research Council; Swedish Chemical Society; Swedish Physical Society; Swedish Ministry of Education; Uppsala Joint Group for Materials Research; and Uppsala University.

The Conference was concerned with the compounds formed between transition metals and the elements hydrogen, boron, carbon, silicon, germanium, tin, nitrogen, phosphorus, arsenic, antimony, sulfur, selenium and tellurium; with oxygen and the halogens being excluded. Research in this area has long and illustrious traditions at Uppsala University ever since the pioneering work by G. HÄGG on the interstitial compounds. In recent years, a strong development towards interdisciplinary research has taken place, with cooperation between research groups in solid state chemistry, solid state physics and quantum chemistry. The scientific atmosphere in Uppsala was accordingly most appropriate for receiving the participants of V ICSCTE, since one of the principal aims of the Conference was to bring together chemists, physicists, experimentalists and theoreticians to discuss the various problems of the compounds concerned in a broad interdisciplinary manner. In keeping with this idea, the Conference was held without parallel sessions.

V ICSCTE brought together about 200 participants. The Conference was opened by the Vice-Chancellor of Uppsala University, T. SEGERSTEDT and greetings from IUPAC were conveyed by F. JELLINEK (Groningen) and from IUPAP by F. BERTAUT (Grenoble). The scientific contributions to the Conference—nine invited lectures and 97 papers—were presented at nine oral sessions and two poster sessions, each poster session comprising some 20 papers.

As in previous conferences in the series, the necessity of sufficient solid state chemistry studies before making measurements and interpretations of physical properties was frequently emphasized. Methods for determining the extent of nonstoichiometry in the compounds of interest at the conference were reviewed in a lecture by H. RAU (Aachen). Problems in chemical synthesis and in thermodynamics were treated in a large number of papers, studies of the synthesis and

crystal growth of rare earth compounds by E. KALDIS and coworkers (Zürich) being particularly interesting. The use of chemical transport techniques for crystal growth played an important role in several contributions. The introduction of the theoretical transport flux function optimization methods by M. RICHARDSON and B. NOLÄNG (Uppsala), for finding suitable experimental conditions for chemical transport appears to be a good starting point for future development.

Another feature of this Conference, as has previously also been the case, was the strong representation of French work in the field of chalcogenides, with contributions amongst others from the laboratories of J. FLAHAUT and O. GOROCHOV (Paris): A. MARAIS (Bellevue); M. CHEVRETON (Villeurbanne) and J. ROUXEL (Nantes).

Crystal chemistry was the main theme in the lectures by W. JEITSCHKO (Giessen), V. JOHNSON (Wilmington) and R. FRUCHART (Grenoble). JEITSCHKO discussed the structures of nonmetal-rich transition metal silicides, phosphides and sulphides, such as PdPS, CrP₄, MnP₄ and the high pressure compounds VP_{1.75} and NbP_{1.75}, while JOHNSON presented a number of compounds having the ternary PbFCl or the quarternary 'filled' PbFCl structure. FRUCHART reviewed the properties of a class of ternary or quarternary compounds MM'X (M, M' = 3d or 4d transition metals, X = P, As). Extensive studies by FRUCHART (Senateur) and coworkers have revealed interesting correlations between *d* - *d* interactions and crystal structure types, as well as rules for the ordering of the metal atoms on the different sites in the structures.

Crystal chemistry also formed an important part of the review of transition metal borides presented by R. NASLAIN (Bordeaux). As regards the physical properties and electronic structure, NASLAIN mainly treated the di- and hexaborides, for which much new information has been obtained in recent years, as for instance the band calculations made by PERKINS (Glasgow).

The invited lecture by B. STALIŃSKI, Wrocław, treated the electronic and related properties of the rare earth hydrides. STALIŃSKI touched upon the classical controversy between the 'protonic' and the 'anionic' model for describing the state of hydrogen in these compounds, and presented recent theoretical and experimental work consistent in a general sense with the 'anionic' model.

Electronic structure was discussed in more general terms in the lectures by C. HAAS (Groningen), and J. -L. CALAIS (Uppsala). HAAS gave a qualitative picture of the factors, which determine the

localization of electrons, and illustrated the various cases occurring by examples taken mainly among the transition metal chalcogenides. CALAIS surveyed the band structure calculations carried out in recent years for the compounds of interest to the conference. He then went on to assess the need for and the possibilities of carrying out various kinds of band calculations for transition metal compounds and suggested several interesting lines to pursue in future work.

The layered transition metal dichalcogenides, and the compounds formed by intercalation of extra metal atoms or organic molecules between the layers were the subjects of several important communications at the Conference, notably by the Dutch school at Groningen. F. J. Di SALVO (Murray Hill) gave an invited lecture on charge density waves in these compounds. He started with a brief survey of the CDW phenomenon and then went on to discuss in more detail the role of stoichiometry and chemical substitution in determining the appearance and parameters of the CDW.

The remarkable magnetic properties often displayed by the compounds discussed at the Conference were treated in numerous communications, as for instance the reports by various research groups at Grenoble working by neutron diffraction methods and the survey by A. KJEKSHUS of the work on MnP-type compounds in Oslo.

Although the use of the compounds concerned in practical applications was not discussed in any specific session, the subject was touched upon on several occasions. Energy storage problems were mentioned in connection with the rare earth hydrides discussed by STALIŃSKI as well as in some of the papers on chalcogenides and intercalation compounds. Several contributions dealing with the fundamental properties of refractory transition metal borides, carbides and nitrides of importance in steel and cemented carbide technology were also presented.

The Uppsala Conference was the fifth in a series, which was initiated by A. MICHEL (Paris) and H. NOWOTNY (Vienna) in 1965. The development has shown that these conferences indeed fill a great need for a regular forum for exchange of ideas among the scientists working in the research area concerned. The V ICSCTE appeared to be as successful as its predecessors as a medium for scientific communication. Poster presentations, which are now well established means of communication at scientific meetings, were introduced for the first time at the Uppsala meeting and the posters shown were generally of excellent standard. The success of the V ICSCTE also depended to a large extent on the eminent skill of all the invited lecturers

in introducing their subjects to an audience representing a wide spectrum in scientific background and research interest.

No proceedings from the V ICSCTE will be published, but the volume of Extended Abstracts can be obtained at a nominal price from the organizers.

The next conference in the series will be organized by A. RABENAU in Stuttgart (1979).

S. RUNDQVIST

III INTERNATIONAL MEETING ON BORON CHEMISTRY

Munich and Ettal, 5 - 9 July 1976

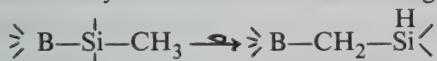
The third IMEBORON Meeting, sponsored by IUPAC and the German Chemical Society (GDCh), was opened by a festive session at the University of Munich to commemorate ALFRED STOCK'S 100th birth anniversary and continued at Ettal, a small village at the foot-steps of the Bavarian Alps, where all participants stayed in a single hotel and where a suitable lecture hall was provided by the nearby monastery of Ettal. 85 participants from Algeria, Belgium, Czechoslovakia, France, Germany, Japan, Norway, Switzerland, UK, USSR and USA attended the meeting. The small number of scientists attending this meeting as well as the surroundings proved to be optimal for discussions and for personal contacts during the meeting.

During the festive session at Munich, where the meeting was opened by Prof. GLEMSER (President of GDCh) welcome addresses were given by Profs. MALATESTA (President of IUPAC Inorganic Chemistry Division) and D. STACHEL, Vice-president of the University of Munich. The presentation of the ALFRED STOCK Memorial Award of GDCh to Prof. H. NÖTH for his contributions to inorganic chemistry, especially boron chemistry, and the *Doctor Honoris Causa* degree of the faculty of chemistry and pharmacy of the University of Munich to Prof. W. N. LIPSCOMB highlighted this session during which Prof. E. WIBERG presented a touching and rhetorically masterful account on the life and achievements of ALFRED STOCK, the founder of boron hydride chemistry and an eminent chemist of his time. Prof. LIPSCOMB (Harvard University) presented in his fascinating lecture on 'Structure and Bonding in Boron Hydrogen Compounds' new views in which the fractional three center bonds played

an important rôle. The topics chosen for this meeting were introduced by plenary and section lectures from authorities in the respective fields. These topics were: (i) Boron Hydrides and Derivatives, (ii) Carboranes and Heteropolyboranes, (iii) Metalloboranes and Metalloheteroboranes, (iv) Boron Heterocycles, (v) Organoboranes, (vi) Theoretical Aspects of Boron Chemistry, (vii) Application of Boron Compounds in Synthesis, Analysis and Catalysis.

W. BÜCHNER (plenary lecture) and E. A. SULLIVAN showed convincingly that NaBH_4 is now one of the most widely used boron-hydride derivative, primarily used as a versatile reducing agent in pharmaceutical industry, silicon chemistry and for the electrodeless nickel plating (Baeyer's NIDOBUR-process). It can also be applied to remove heavy metal from waste water, mercury, lead, silver and copper being quantitatively precipitated. Also it offers itself for the recycling of silver from the fixing baths, a possible application in photo-industry.

The topic on boronhydrides was introduced by Prof. S. G. SHORE who showed how the concept of Brønstedt acidities of boranes can be used in the preparation of new boronhydride anions especially to expanded anions of the hypophosphate-type, which in turn can be converted to B_5H_{11} , B_6H_{10} and B_6H_{12} in high yield. He also showed how these ideas can be used for the synthesis of metalloboranes. In contrast, the work by KODAMA and by PARRY stressed the Lewis acid properties of the higher boranes towards various bases, especially the methylamines. Product distribution and their temperature dependence gave additional insight into the mechanism of these important reactions. J. LEACH presented an interesting account on silylorganopentaboranes, where Si bridged species are the kinetically controlled products and the 2- or the 1-substituted compounds the thermodynamic ones. Moreover they detected the interesting rearrangement



where finally a carborane species is formed with elimination of H_2 .

Significant progress has been made in the synthesis and characterization of metalloboranes, metalloheteroboranes and heteroboranes. This was demonstrated clearly in Prof. N. N. GREENWOOD'S plenary lecture by many new types of compounds, e.g. $[(\text{C}_6\text{H}_5)_3\text{P}]_2\text{CuB}_5\text{H}_8$ where the copper atom bridges two boron atoms; by M. G. H. WALLBRIDGE who presented a detailed account on aluminium-borohydride including the interesting $(\text{BH}_4)_2\text{AlB}_3\text{H}_8$; by D. F. GAINES who synthesized $\text{Be}(\text{B}_3\text{H}_8)_2$, which is structurally non-

fluxional; by R. N. GRIMES, who reported on 14-vertex iron-carboranes; by G. E. HERBERICH, who discussed bis(borabenzene)-complexes and the tripledecked borole complexes in his section lecture as well as by W. SIEBERT and K. KINBERGER, who found that thiadiborolenes form nido- and closo-structures with transition metals. Summarizing, the following types of metal - boron features become evident: (i) incorporation of the metal in the boron polyhedron; (ii) substitution of a bridge hydrogen atom by a metal atom; (iii) substitution of a terminal hydrogen atom by a metal atom; (iv) bonding of the metal via a hydrogen bridge to the borane skeleton.

Particularly variable is the carborane skeleton, as B. STIBER showed. He referred particularly to the new nido-anion $6\text{-CB}_9\text{H}_{12}^-$. This is also true for sulfur-containing borane species, and R. W. RUDOLPH presented a wealth of information on new compounds of closo- and nido-species, which all obey the electron counting rules.

The chemistry of borane derivatives was introduced by Prof. B. N. MIKHAILOV. He reported on the most interesting cyclic coordination compounds of boron, where an aromatic type of substitution behaviour is often observed. And K. NIEDENZU in his section lecture showed new aspects of the aminoboronation reaction which, applied to 2-amino-pyridine, gave most interesting new BN-heterocycles. An unusual type of dimerization was observed by H. FUSSTETTER in B, B' -difluorotriazaborolidines in which a F/N exchange occurs. And the long sought monomeric borazines have now been unambiguously prepared by P. I. PAETZOLD in the gas-phase pyrolysis of suitable silylaminoboranes. New aspects on elimination reaction of boryl-substituted amino-phosphorus, -silicon and -boron compounds leading to new EN_2B - four membered rings were demonstrated by W. STORCH; and G. FRITZ and H. HÖLDERICH showed that trimethylsilylphosphinoboranes which are monomeric add significantly to the further development of boron phosphorus chemistry.

Organoborane chemistry has for the first time been included in the IMEBORON programme due to its increasing importance. And R. KÖSTER stressed this aspect. He concentrated on the use of activated triethylborane in synthesis, analysis and application. Thus the R_2B group may act as a protecting group, and since the borylation of the OH group in saccharides depend primarily on kinetic factors, amylose in starch can be separated from amylopectin by a borylation procedure. Details of the borylation of sugars that added to KÖSTER'S report, were given by DAHLHOFF, who discussed the steric requirement for the formation of five and six membered rings.

Of particular interest are new methods for C—C bond formation by means of organoboranes, and new versatile methods were reported by D. S. MATTESON, K. SMITH and B. WRACKMEYER, who used XHCB(OR)_2^- , $\text{R}_3\text{BCR(SPh)}_2^-$ and $\text{BR}_3/\text{R}_3\text{SnC}=\text{CSnR}_3$ as reagents respectively. Moreover, the electrolysis of triorganoboranes R_3B in CH_3CN or CH_3NO_2 in the presence of $\text{R}'_4\text{NX}$ is an excellent means for providing nitriles RCH_2CN , nitro compounds RCH_2NO_2 or by reaction with acrylacrylate $\text{RCH}_2\text{CH}_2\text{CO}_2\text{Et}$.

Aspects of the application of i.r. photochemistry to boron chemistry as a synthetic tool were discussed by H. NÖTH, reporting *inter alia* on the synthesis of $\text{B}_{20}\text{H}_{16}$ and HB(SH)_2 .

The application of physical methods to gain information on structure and bonding always finds great interest. Therefore the formulations by S. HERMANEK on structural correlation of higher boranes with ^{11}B -n.m.r. shifts, where the diamagnetic part to the shielding seems to be significant, was well received and discussed. These correlations will help in assignments. Also ^{11}B -decoupled ^1H -n.m.r. spectra of boranes and the magnitude of J_{BB} gives important structural information in particular to fractional bonding, as J. ODOM told the audiences. Finally G. GUNDERSEN determined the BN bond-lengths in the series $(\text{CH}_3)_{3-n}\text{B}(\text{NHCH}_3)_n$ which gives direct evidence for the increasing bond-order with decreasing values of n . Moreover it was agreed in a general discussion that boron chemists should use a different sign convention for ^{11}B chemical shifts (negative sign up-field from the standard) to bring it in harmony with other nuclei.

Of course also the other reports not referred to here have added in our understanding of the chemistry of boron and its further development. All lectures were open to discussion and the time allotted for discussion was usually too short, but since the discussions went on during the intervals and in the afternoons and evenings there was a vivid exchange of information and ideas.

The participants of IMEBORON III not only were very engaged in the scientific programme of the meeting but also enjoyed an organ recital at the church of Ettal, a wine tasting party and a folkloristic 'Bavarian Evening'.

IMEBORON III has demonstrated the increasing importance of boron chemistry in many areas of chemistry and those participating agreed that it was worth attending and that IMEBORON conferences should continue.

H. NÖTH

II INTERNATIONAL SYMPOSIUM ON POLYVINYL CHLORIDE

Lyon-Villeurbanne, 5 - 9 July 1976

The first international symposium on polyvinyl chloride (an IUPAC microsymposium) was held in Prague in September 1970. Since then two PVC meetings had been held in Chicago (August 1973) and in Darmstadt (September 1974). The constant interest on PVC induced us to organize a Second International Symposium which was held at the Claude Bernard University in Lyon-Villeurbanne on 5 - 9 July 1976. The symposium was a 'Colloque International' du Centre National de la Recherche Scientifique (CNRS) and was sponsored also by IUPAC and by the Group Français d'étude et d'application des Polymères' (GFP).

More than 350 delegates were present coming from 29 countries in the 5 continents. One out of three was French, 60 were from Federal Republic of Germany (FRG). One of the major countries, namely the USSR, was not represented, although one main lecturer had been chosen after the recommendation of the IUPAC committee, to be a Russian and also one of the panelist. A few Russian papers expected to be presented were cancelled one week before the Symposium.

Prof. GERMAIN, Chairman of Claude Bernard University gave the opening address as the host; IUPAC was represented by Dr. DE VRIES, Secretary of the Macromolecular Division, and Dr. DUCOM was the official delegate of the CNRS; Chairman of the Symposium acted also as the official delegate of the third sponsor, viz. GFP. The program was divided into 8 main sessions covering the whole range of scientific and technical activities concerning this polymer, namely: Polymerization, Chemical Modifications, Characterization, Rheology and Viscoelasticity, Processing, Properties, Degradation and Stabilization, and finally Combustion and Toxicity.

An effort had been made to avoid parallel sessions, in order to allow everyone to listen to the main contributions to all the 8 topics. But, because of the large number and the good level of the contributed papers, a set of 5 parallel sessions was organized on 8 July (morning). So each topic was developed in a half a day session without any parallel event and eventually a parallel session on the Thursday morning. Each main session was composed of an invited main lecture, a set of 4 - 6 contributed papers and a rather long (1 ½ h) panel discussion with invited outstanding scientists. The invited main lectures will be pub-

lished in the IUPAC journal *Pure and Applied Chemistry* and (tentatively) also as a separate symposium volume by Pergamon Press, Oxford.

The symposium began with the session *polymerization*. In the absence of the Russian main lecturer, the Symposium was opened by a very interesting movie produced by Dr. E. A. COLLINS (B. F. Goodrich, Cleveland, USA) about the formation of the polymer grain, showing very well the skin of the suspended pearls and the different steps of the grain and agglomerate formation. Four contributed papers were presented after that, all of them on the nascent morphology of PVC either in a unique droplet (Dr. ZICHY, ICI, UK) or in the autoclave under continuous addition of monomer (Dr. ALLSOOP, ICI, UK) for the suspension process. Grain formation and influence of various parameters in the bulk process were discussed by Dr. PALMA (Montedison, Italy) and Dr. BOISSEL (Rhône-Poulenc, France). During the panel discussion, Prof. GEIL discussed how to study morphology, especially how to look at the evidence for the 100 Å primary particles. Then Dr. UGELSTADT (Trondheim, Norway) presented a review of the model postulated to describe the kinetics of polymerization and discussed the main interest and deficiencies of all of them. This review was completed by a presentation by Dr. OLAJ who showed that some of them were definitely to be rejected and discussed also the correlations between the polymerization kinetics and the nascent morphology. Another aspect of the problem was presented by Dr. KOLINSKY (Prague, Czechoslovakia) the organizer of the first PVC symposium, namely the changes introduced by copolymerization. After these four presentations the time was limited for the discussion with the audience so that after a few questions and answers the discussion was delayed to the parallel session. A second movie was presented at this parallel session by Dr. CHATELAIN. It described the bulk process which was developed in the Saint-Fons plant in the Lyon suburbs—about 50 participants visited the plant afterwards. In the meantime the session was continued and in a first part, a set of papers were presented dealing with the polymerization kinetics either in bulk (Dr. OLAJ, Prof. HAMIELEC), suspension (Drs. GEORGE and SORVICK) or emulsion (Dr. LIEGEOIS) polymerization. A second part of the session dealt with modified polymerization with the contribution of Drs. MATSUDA and LAMBLA. Dr. BERENS of the B.F. Goodrich acted as the discussion leader.

The second session dealt with *chemical modifications* with Prof. KENNEDY (University of Akron, USA) as Chairman. The main

lecturer, Dr. T. SUZUKI (Nippon Zeon, Japan) gave a review of the chemical modification with specific relation to improvement of thermal properties, without disclosing however the nature of the modification introduced by his company in the famous alpha 30. The contributed papers were mostly related to the improvement of thermal stability (Prof. NAKAMURA) or grafting of polymer on a PVC backbone by either a radical (Prof. GARNETT), cationic (Prof. KENNEDY) or anionic (Dr. PILLOT) process, or ionic dehydrochlorination (Prof. FLODIN). Only a few papers dealt with true chemical reactions namely ozonization (Dr. MICHEL) or chlorination (Dr. LUKAS). Except for one question about the use of grafted polymer as support for enzymatic or complexes catalysis, the discussion either in the main or in the short parallel session, was mostly concerned with the improvement of the thermal stability and how to estimate it; some distinctions were to be made between the degradation under static or dynamic conditions.

Dr. CARREGA (Rhône-Poulenc, France) was the lecturer in the session on *characterization*. He presented a very complete review about the progress in molecular characterization since the first symposium. On this point his presentation was supplemented by the contribution of Prof. PARK (UWIST, Cardiff, UK) during the panel discussion. The question of branching and molecular weight distribution had been resolved but further work was needed to be done on the double bonds and head to head structures. An international group had been constituted to study these questions and a proposal for an IUPAC working party to be established will be presented. The question of the order of PVC was still unclear and no important progress had been made during the last five years. Dr. CARREGA also presented the methods of characterization of the morphology of PVC and his talk was substantiated by the contributed paper of Dr. TREGAN from the same laboratory. Prof. GEIL very briefly presented a very important and long contribution to the processing-morphology-property relationship of PVC multiphase systems, although Dr. MADDAMS spoke about the contribution of Raman Spectroscopy to the problem of characterization of the structure before and after thermal degradation. The panel discussion was conducted by Prof. GEIL, on questions of the audience. It was continued after the short parallel session and a statement was proposed for the term to be used to describe the morphology of the polymer.

Prof. PEZZIN (University of Bologna, Italy) was the chairman of the session on *rheology and viscoelasticity* at which Dr. E. A.

COLLINS was the main lecturer. His review clearly showed the transition in the rheological behaviour of PVC under melting; the exact events associated with these transitions remain unclear although they might probably be described as the disappearance of some granular structure. As shown also by the contributed paper of this session by MUNSTEDT (Lyngae-Jorgensen Mennig, Pezzin, Bertilsson and Bauwens), the interpretation of rheological measurements might be complicated by the slip properties of the polymer. The contribution of the TNO to these problems was presented during the panel discussion by Dr. WALES.

In the session on processing Prof. MENGES (Aachen, Germany) presented a review of the various methods of processing with remarks about the specific problem of rigidity of plasticized PVC. In the second part Prof. MENGES spoke about the morphology after processing and clearly showed that a granular structure remains. He presented a very interesting and controversial model comparing the processed PVC grains to moist salt grains. A large part of the question of the audience were asked about this model. Two contributed papers dealt with calendering (Drs. AGASSANT and BOURGEOIS), mostly on the theoretical point of view and they gave rise to interesting exchanges during the panel discussion after introductory remarks by Dr. CHAUFFOUREAUX (discussion leader—Solvay, Belgium). Dr. AVENAS (Ecole des Mines, France) and Dr. GOULD (ICI, UK). Another part of the session was concerned with *extrusion* in which the contributed paper of PREDOHL (Aachen, FRG), and *injection* (paper by LEVÊQUE and KACIR) were presented. Finally, interesting contribution and characterization studies were presented about the impact modifiers (paper by FLEISCHER, HAAF and SAHAJPAL) and a clear correlation between the stress whitening and the formation of voids was shown (paper by HAAF).

After a half-day relaxing time in Beaujolais and the five parallel sessions, the sixth main session took place on Thursday afternoon with the studies of properties. Dr. DE VRIES was the discussion leader and the main lecture was given by Dr. JACOB (Solvay, Belgium) who presented an interesting report about the influence of the surface defects on the fatigue properties and the brittleness of PVC fabrics. The subject was completed by the contributed papers of Dr. RADON and of Prof. MANSON (Leigh University, USA), both presented by Prof. MANSON. The fractions properties are clearly related to the molecular weight of PVC. A number of various contributed papers were presented too. The first one, by Dr. BERENS

about the diffusion of the monomer in the polymer was a basis for discussing the problem of the residual monomer in the polymer. A paper by Prof. RANBY about compatibility completed the studies on multiphase systems, already presented in the previous session. Finally the contributed papers by PEZZIN and SMITH (University of Lancaster, UK) pointed out the very important effect of thermal history on the properties. This point was the central part of the panel discussion with the contributions of Drs. DE VRIES and ILLERS (BASF, FRG). A complete understanding of the influence of the thermal history is certainly not possible without further studies about the nature of the crystalline state in PVC.

Degradation and stabilization were developed by the larger number of contributed papers, although several of them expected from scientists of the eastern Europe, were not presented. A full parallel session in two parts was organized in this field. The main lecture by Dr. WIRTH (Ciba-Geigy, FRG) mostly dealt with thermal stabilization; the various functions, prevention as well as corrective, of the tin stabilizer were clearly explained. The stabilization mechanisms are not yet quite clear, but much progress has been made in the last few years. On the other hand, stabilization against light is always empirical. The reason is probably the fact that the actual mechanism of the ultra-violet degradation of PVC remains unclear. In this context the contributed paper by Dr. VERDU (ENAM, France) might be a starting point. It was related to the contributed paper of Dr. MARKS on the characterization and aging of PVC by reflectance infrared spectroscopy. A few papers were presented about stabilization, dealing with either the mechanism of stabilizers (Dr. TRAN, Lyon, France), the measurement of stabilizer consumption (Dr. STEPEK, paper presented by Dr. KOLINSKY and Dr. WESTERBERG) or new stabilizer (paper of Dr. SHAKOOR and BICART-SEE). A very interesting contribution was presented by Dr. IIDA about the effect of the various constituents of the stabilizer formulation on the coloration of the fabric and also the synergistic effect in discoloration. Pure thermal degradation was not forgotten, with the paper of ABBAS (Sweden) about polyene sequences and the presentation of Dr. KELEN (Hungary) on secondary reactions during the panel discussion, conducted by Prof. BRAUN (Darmstadt, FRG) and contributions by Dr. MICHEL (CNRS, France) and Prof. POLLER (Queen Elizabeth College, London, UK) on the stabilization mechanism by either the zinc - calcium or organotin type of stabilizer. A long discussion followed these presentations.

The last topic of the symposium dealt with the problem of *combustion and toxicity*. A special panel discussion had been organized about the problem of the monomer toxicity and successively Dr. THOMAS (Rhône-Poulenc, France), Dr. STAFFORD (ICI, UK) and Dr. FREIESLEBEN (Wacker Chemie, FRG) explained how the problems had been cooperatively studied, defined and solved, from the point of view of either the residual monomer in the fabrics, or the level of monomer in the atmosphere of the plants working with monomer production or polymerization. The main session was meant to study combustion. Chemical aspects were reviewed by Dr. O'MARA (main lecturer—Goodrich, USA) as also the problem of smoke production, discussed also by Dr. LECOMTE (University of Liège, Belgium) and Dr. DELFOSSE (University of Lille, France). Dr. WOOLEY (Boorehampton, UK) discussed the fire test on a large scale, together with Dr. SMITH (Queen Mary College, London, UK). Prof. EINHORN (Fire Research Center, University of Utah, USA) gave a very impressive talk about the problem of smokes toxicity whereas Dr. JOUANY (University of Chatenay, France) showed how water might be used as a protection against HCl evolution. Obviously much remains to be done to solve combustion problems, in spite of PVC being an auto-extinguishing polymer.

The closing remarks were presented by Prof. GEIL who proposed to organize a third PVC Symposium in 4 - 5 years.

A. GUYOT

**INTERNATIONAL SYMPOSIUM ON
LOW-MOLECULAR WEIGHT
SULFUR-CONTAINING NATURAL PRODUCTS**

Jablonna, 6 - 10 July 1976

The Symposium was held at the Meetings and Conference Palace of the Polish Academy of Sciences, at Jabłonna near Warsaw, under the sponsorship of IUPAC; Polish Academy of Sciences: Chemical Sciences Committee; and Chemistry Department of Warsaw University. A total of 80 participants of the Symposium represented the following countries: Austria, Brazil, Canada, Czechoslovakia, Denmark, Federal Republic of Germany, France, German Democratic Republic, Hungary, Italy, Japan, Norway, Poland, Sweden, UK, USA and USSR.

Every effort was made by the sponsors (including 20 persons from the Warsaw University who worked on the Organizing Committee), to ensure for the participants that their stay be both fruitful and enjoyable. At the opening ceremony held at the Fireplace Hall of the Meetings and Conference Palace the welcome address was delivered by Prof. J. T. WRÓBEL, Chairman of the Scientific and Organizing Committee of the Symposium.

In the opening plenary lecture Prof. KJAER (Denmark) pointed out the significance of the low-molecular weight sulfur-containing natural products, as sulphides, thioglycosides, terpenoids, and amino acids for both the plant and the animal world. The lecturer expressed the hope that the progress in research in this field will help in elucidating the origin and biological significance of the organic sulfur compounds of that kind without which the equilibrium of the living cells cannot be maintained.

Low-molecular weight sulfur compounds are known to occur amongst the products of microorganism biosynthesis. Of the most numerous and best known are antibiotics. How often does sulfur occur in those compounds and in what form? This interesting question was answered by Prof. N. N. LOMAKINA (USSR) in her comprehensive review on the current achievements in this field.

The chemistry of glucosinolates was reviewed by Prof. M. BENN (Canada), who also covered metabolic transformation of these compounds. Conversions of penicillin and cephalosporin molecules to their sulfur-free heteroanalogues are the subjects of recent synthetic effort, and Prof. S. WOLFE (Canada) reported on a number of interesting methods for substituting the penicillin sulfur by other heteroatoms such as oxygen, etc.

The components of naturally occurring peptides and metabolites are dehydro amino acids, alpha-methoxy amino acids, and alpha-mercapto amino acids. Syntheses of these compounds, their transformations and possible interconversions were covered by Prof. U. SCHMIDT (Austria).

Advances in research on the sulfur Nuphar alkaloids were presented by Prof. R. LaLONDE (USA) who dwelt at great length upon the structure of thiaspirane alkaloids discovered earlier by Polish researchers. He covered in particular a possible use of such techniques as ^{13}C -n.m.r., o.r.d., and c.d. in the structural studies.

The biotin chemistry, highly developed in the years 1940 - 1950, has aroused renewed interest today. Prof. A. MARQUET (France) reported on highly attractive stereospecific alkylation reactions of bio-

tin sulfoxides to result in its novel analogues. The behaviour of some analogues with acetyl CoA carboxylase of *E. coli* was discussed. In addition, the first synthesis of selenobiotin was announced.

Results of investigations on the role of *S*-adenosylmethionine (Ado - Met) in the transmethylation and transsulphuration reactions were presented by Prof. F. SALVATORE in his plenary lecture on behalf of Prof. V. ZAPPIA, the co-author, who could not be present at the Symposium. The position of the bond of the sulphonium compound with the methyl-containing enzymes was substantiated, and the relationship between the Ado - Met sulphonium moiety and biological activity of the molecule was pointed out. Geometrical aspects of the sulphonium moiety of *S*-methyl-L-methionine hydrochloride have been elucidated using the single-crystal X-ray diffraction technique.

An outstanding authority in the field, Prof. S. OAE (Japan) covered some interesting reactions of oxidation of cyclic disulphides which *in vitro* lead to sulfoxides or sulphones. Under the enzymic oxidation conditions the reaction was found to be specific.

The plenary lectures will be published in 1977 in an issue of the IUPAC journal *Pure and Applied Chemistry*, and as a separate symposium volume by Pergamon Press, Oxford.

In addition to the plenary lectures mentioned 13 communications, out of the total of 15 submitted, were presented. The communications were reasonably woven into the proceedings of the Symposium. The lectures were given in the order: F. GIOVANNI, F. SALVATORE, A. JEZIERSKI, M. MICHALSKA, M. MIKOŁAJCZYK, J. MIREK, M. LEPLAWY, J. MIKOŁAJCZYK, A. LIPKOWSKI, I. WILLHARDT, J. JASZBERENYI, I. STIBOR, and V. GULTIAI. The communications were concerned with such problems as the chemistry of sulfur-containing amino acids, sulfur ligands, nucleic acids, mercaptans in the specific reactions of penicillin reduction and of penicillin analogues, peptides, thiosugars, and the thiophene chemistry.

The accompanying informal program included, among others, a Chopin's concert in the beautiful Łazienki Gardens, sightseeing tour of Warsaw—the Old Town, Royal Castle, and Wilanów Palace—and attendance at a soiree performance at the Studio avant-garde theatre. The trip to the Tarnobrzeg brimstone mine, probably the largest in Europe, aroused much understandable interest. A stay at the ancient Aristocratic Palace at Baranów, referred to as the second Cracow's Wawel, was much appreciated by the participants.

A. POPEŁAWSKI

V INTERNATIONAL SYMPOSIUM ON MEDICINAL CHEMISTRY

Paris, 19 - 22 July 1976

The Symposium was organized by the Société Française de Chimie Thérapeutique under the sponsorship of the International Union of Pure and Applied Chemistry (Medicinal Chemistry Section), the Fédération Internationale Pharmaceutique (FIP) and the European Federation for Medicinal Chemistry (EFMC). Held at the Palais des Congrès (Paris Convention Centre), Place de la Porte Maillot at Paris, the Symposium was attended by 700 active and accompanying persons from 28 countries.

The Symposium was opened by Dr. J. E. THUILLIER, President of the Symposium and at the Opening Ceremony, Dr. E. J. ARIËNS, Official Representative of IUPAC welcomed the participants. The official languages were English and French, but most of the lectures were given in English for the benefit of foreign scientists. The scientific programme included 15 main lectures, 17 short lectures, 1 round-table and 105 poster presentations. The topics under which the symposium was classified and the main lectures (as well as some others) presented under each topic are given hereunder.

Peptides (Chairman: R. GUILLEMIN, USA. Session Moderator: G. MILHAUD, France).

A. V. SCHALLY (USA)	Hypothalamic regulatory hormones and their synthetic analogues (main lecture)
M. JUTISZ (France)	Hormones hypothalamiques hypophysiotropes, identité et mode d'action (main lecture)
W. VALE (USA)	Physiology and pharmacology of the hypophysiotropic hormone of the hypothalamus (main lecture)
R. F. HIRSCHMANN (USA)	Some recent developments in the synthesis of biologically active peptides
R. GEIGER (FRG)	The approaches of peptide chemistry to insulin
W. RITTEL (Switzerland)	Synthesis of insulin peptides

P. RIVAILLE (France)	Synthesis in the field of 1 - 34 human parathyroid hormone fragments, their <i>in vivo</i> and <i>in vitro</i> bioactivity and immuno-reactivity
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Pro-drugs (Session. Moderator: V. STELLA, USA)

A. J. GLAZKO (USA)	Pro-drugs yesterday, today and tomorrow
H. DEMARNE (France)	Pro-drugs: modulation of drug distribution and efficiency
G. BOURAT (France)	Long chain esters of pipotiazine as long-acting psychotropic pro-drugs
P. BEY (France)	Pro-drugs specifically activated by their target receptors: Kcat enzyme inhibitors
A. A. SINKULA (USA)	Pro-drugs, protective groups and the medicinal chemist

Strategy in Drug Research (Round Table. Moderator: E. J. ARIËNS Netherlands)

A. A. PATCHETTI (USA)	Trends in the search for new discoveries in pharmaceutical research
J. G. TOPLISS (USA)	A manual method for applying the Hansch approach to drug design
K. R. H. WOOLRIDGE (UK)	Reducing the gamble in drug research
P. SIMON (France)	Bases pour le choix d'une stratégie pour la recherche des médicaments psychotropes
K. E. BÜCHEL (FRG)	Correlation studies with antimycotics and fungicides of the azole-group
J. P. RAYNAUD (France)	A strategy for the design of potent hormones and anti-hormones

Central Nervous System (Chairman: S. GARATTINI, Italy. Session Moderator: J. -R. BOSSIER)

I. CREESE (USA)	Brain neuro-transmitter and drug receptors (main lecture)
P. MANDEL (France)	Neural inhibition, a tool for research of anticonvulsants (main lecture)
H. M. van PRAAG (Netherlands)	Catecholamines, neuroleptics and psychoses. A study of their inter-relations (main lecture)
M. WILHELM (USA)	Recent approaches in psycho-chemotherapy
B. SCATTON and L. JULOU (France)	Effects of neuroleptics on dopamine metabolism in the nigro-neostriatal, mesolimbic and mesocortical dopaminergic systems: new approaches in the research of antipsychotic drugs
C. GIURGEA (Belgium)	How to deal with an unusual pharmacological pattern: the nootropic case
J. B. TAYLOR (UK)	A novel series of annelated benzodiazepines

Cardio-vascular Drugs (Session. Moderator: B. SWYNGHEDAUW, France)

J. L. IMBS (France)	Inhibitors of the renin-angiotensin system
R. E. NITZ (FRG)	New aspects of coronary therapeutic agents
J. F. GIUDICELLI (France)	Nouvelles acquisitions dans le domaine des inhibiteurs β -adrénergiques
H. SCHMITT (France)	Central sites of action in the development of antihypertensive drugs

Contribution of Immunology to Medicinal Chemistry (Chairman: R. MONIER, France)

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| E. LEDERER (France) | Natural and synthetic immunostimulants related to the mycobacterial cell wall (main lecture) |
| G. MATHÉ (France) | De l'immunopharmacologie à l'immunotherapeutique des cancers (main lecture) |
| J. F. BACH (France) | Thymic hormones (main lecture) |

Prevention of Ageing (Chairman: F. BOURLIÈRE, France)

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| C. G. KORMENDY (FRG) | Pharmaceutical research aspects of ageing (main lecture) |
| L. ROBERT (France) | Cellular and molecular aspects of ageing. Role of the intercellular matrix (main lecture) |

New Methods of Synthesis (Chairman: J. JACQUES, France)

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| J. M. CONIA (France) | Les éthers d'énols silyliques: leur intérêt en synthèse organique (main lecture) |
| L. GHOSEZ (Belgium) | From carboxylic acids to heterocycles (main lecture) |
| B. M. TROST (USA) | The development of new synthetic methods as applied to the synthesis of natural products (main lecture) |

There was a rather small but very interesting and useful exhibition located at the entrance of the lecture rooms. Thanks to the 'Paris Convention Centre' which is a whole world in itself (it is a place to work in, to relax in and to enjoy) and which included the Concorde La Fayette hotel, the Symposium afforded good opportunities to meet and talk with other scientists. The social events which were organized included a welcome drink in the Congress Centre on the terrace providing a panoramic view across Paris and the Bois de Boulogne. A

boat cruise on the Seine river was offered by the Organizing Committee and in the evening a reception was also offered at 'Artcurial'—the new contemporary art centre in Paris—which welcomed all the participants to the Berrocal's exhibition 'in homage to Picasso'. A visit to Institut Pasteur was also arranged. On the last day a gala dinner was held at 'Union Interalliée' in the famous Faubourg Saint-Honoré and attended by many participants.

On the occasion of the Symposium, the European Federation for Medicinal Chemistry held a meeting on 18 July, and the Section on Medicinal Chemistry of IUPAC had an official meeting on 19 July.

J. E. THUILLIER

VI INTERNATIONAL SYMPOSIUM ON PHOTOCHEMISTRY

Aix-en-Provence, 19 - 23 July 1976

The Symposium was held in France at the Université d'Aix-Marseille III with the scientific sessions in the lecture theatres of the Faculté de Droit. About 290 participants from 25 countries were attracted to the meeting, which comprised plenary lectures, contributed papers and workshop sessions. The high scientific standard set by the previous five IUPAC sponsored Symposia on Photochemistry was maintained at Aix-en-Provence; the fifteen plenary lecturers were from academic and industrial institutions and were of international reputation and authorities in their respective fields. The Plenary lectures will be published in 1977 in an issue of the IUPAC journal *Pure and Applied Chemistry*, and as a separate symposium volume by Pergamon Press, Oxford. The Organizing Committee are to be congratulated on devising a very varied and stimulating programme which reflected most aspects of photochemistry currently being researched.

The scientific programme commenced with Prof. N. C. BAIRD (Canada) reviewing the state of the art of *ab initio* quantum-mechanical calculations for polyatomic molecules. He made particular reference to predictions of interest to photochemists and the principal areas on energy gaps (singlet and triplet carbenes), and generation of potential energy surfaces in photochemical reactions.

Study of the photochemistry and photophysics of systems having two chromophores separated by, for example, a hydrocarbon chain,

is of current interest and continues to be the subject of many publications. Prof. F. C. de SCHRYVER (Belgium) outlined the general features and points of interest in this subject and went on to describe his own very important contributions to this area particularly in the case of bianthryl systems. At low concentrations, such compounds undergo light-induced intramolecular 'dimerization' whereas at higher concentration true photochemical polymerization occurs with one chromophore of one molecular adding to the chromophore of another. Emission from intramolecular exciplexes and excimers was also described.

Prof. J. GUILLET (Canada) discussed in a particularly clear and lucid manner some studies relating to energy transfer and molecular mobility in the photochemistry of polymers. The changes in photochemistry in going from small to very large molecules were described and the importance of knowing the glass transition temperature of the polymer in relation to the reaction temperature was illustrated by the Norrish Type II process with a phenyl vinyl ketone co-polymer. The photo-Fries reaction of polyphenylacrylate apparently requires little space for there is little reduction in efficiency in going from the polymer in solution to a solid film. Diffusion processes in polymers were illustrated by the Buchi - Paterno reaction of *cis* polyisoprene with benzophenone but a complication here is that as the reaction proceeds the glass transition temperature of the polymer increases.

One of the most studied types of reaction in photochemistry is that involving electron transfer. As pointed out by Prof. A. WELLER (FRG) the ultimate goal of understanding such processes in solution is being approached. Such an objective is important as this process is one of the simplest and because it is important in biological systems. The studies described by Prof. WELLER in his lecture all related to experiments in polar solvents (methanol or acetonitrile) for such donor molecules as pyrene, N,N-diethylaniline, and 3,5-dimethoxy-N,N-dimethylaniline with 1,4-dicyanobenzene and 1,2,4,5-tetracyanobenzene as the electron acceptor partner. Some particularly elegant experiments were described which showed that decay of the radical ions yields the triplet state of, for example, pyrene from the pyrene-N,N-diethylaniline system. The electron-transfer processes have also been studied in the presence of an external magnetic field when there is apparently little effect but to reduce the triplet yield.

In his talk on conformational limitations of photoreactivity, Prof. P. WAGNER (USA) discussed how groups and in particular the methyl group, on the phenyl ring of alkylphenyl ketones affected the

rate constant for intramolecular hydrogen abstraction by the ketone. Methyl in the *meta* and *para* positions of such compounds increases the $n \pi^*$ triplet energy level relative to that of the $\pi\pi^*$ triplet level and thus in comparison with the unsubstituted ketone the rate of the abstraction reaction is decreased considerably in these cases. With methyl in the *ortho* position, the probability of photoenolization is high and this reaction in competition with γ -hydrogen abstraction by the ketone from the alkyl chain was discussed in terms of conformations of the excited states.

The matrix isolation technique has been applied in a number of areas of photochemistry and Prof. J. J. TURNER (UK)—one of the leading exponents of the technique—described its use by his group to elucidate the mechanistic pathways in metal carbonyl photochemistry. The aspect of the work described was the study of fragments of relevance to solution photochemistry, in particular of $\text{Cr}(\text{CO})_5$ and $\text{Fe}(\text{CO})_4$; the mechanism of matrix photochemical processes; and how this aids interpretation of the solution photochemistry of $\text{Cr}(\text{CO})_6$ and $\text{Fe}(\text{CO})_5$.

Prof. T. MUKAI (Japan), well known for his researches into the photochemistry of heterocyclic systems containing the $\text{C} = \text{N}-\text{O}$ or $\text{N} = \text{C}-\text{O}$ groups reviewed his group's work on the photochemistry of a number of 2-isoxazoline derivatives which were used as models for the rigid and constrained $\text{Ph}-\text{C} = \text{N}-\text{O}$ system. Light-induced $\text{N}-\text{O}$ bond fission occurs in most cases to yield a variety of products dependent upon the structures of the starting materials. The pyrolysis of related compounds was also described and the results demonstrate the major differences in the behaviours of the heterocycles when photochemically and thermally activated.

The photorearrangement and fragmentation reactions of pyridinium methylides, N-iminopyridinium ylides, and pyridine-N-oxides were ably and comprehensively reviewed by Prof. J. STREITH (France) who has contributed much of the worthwhile data in this area. He described the complex and fascinating reactions of the mesionic compounds which undergo the two competing processes of photo-cleavage *via* the triplet state which results in pyridines and carbenes, nitrenes, and oxene respectively, and light-induced rearrangement *via* the excited singlet state to yield ring contraction, ring expansion, or ring cleavage products. By the ring expansion reaction of N-iminopyridinium ylides, 1,2-diazepines are thus readily available and this reaction has been used as a step in the synthesis of potential antibiotics.

In the lecture given by Prof. P. COURTOT (France) it was clearly demonstrated that ground state conformations of cyclohexadienes and acyclic hexatrienes play an important role, as well as orbital symmetry factors, in governing the stereochemistry of the light-induced isomerizations of these compounds. The influence of change in wavelength of the exciting radiation was described and from such studies it has been possible to attribute to discreet conformations some specific photoreactions. Some new examples were presented of a $4\pi a + 2\pi a$ stereospecific hexatriene intramolecular photo-Diels - Alder reaction.

The photochemistry involved in vision is an extremely important, interesting, and highly complex area of study. The Symposium Organizers had decided to have two Plenary Lectures on this subject and so we were treated to the excellent and absorbing accounts of the research work of the groups of Prof. K. NAKANISHI (USA) and Prof. M. OTTOLENGHI (Israel). It is known that the visual pigment rhodopsin comprises 11-*cis* retinal as the chromophore and this is bound *via* a protonated Schiff's base to the lysine terminal amino group in opsin. On light absorption at 500 nm, rhodopsin undergoes a fast photo reaction which is followed by a series of rapid thermal reactions which yield as final products all *trans* retinal and the apoprotein opsin. The main aim in the work of Prof. NAKANISHI is to obtain a clear picture of the intermediates and the steric requirements of the opsin receptor site by studying the various isomers by high pressure liquid chromatography. He described that recently using this technique gram scale separations of retinals and intermediates have been achieved. The structures of the compounds are then deduced by extensive p.m.r. studies at 270 MHz. Prof. OTTOLENGHI discussed the models proposed for the primary photo event in vision and concluded that the classical picture of a single *cis* - *trans* isomerization step is the only one which satisfactorily accounts for the available experimental data: this process is temperature independent over a range of 200°C. Compared to the efficient wavelength independent photo bleaching of rhodopsin, the yields of the 11-*cis* to all *trans* conversion in the free chromophore are small and markedly dependent on the wavelength of the exciting light. Both speakers briefly mentioned the practical difficulties of this area of photochemistry and thereby left their audiences suitably impressed with the results which had been obtained.

Dr. H. HARTZLER of the du Pont Company (USA) pointed out that in his particular topic the main objective was not to learn about science but to realize a practical solution to a problem and that the

best way of doing this is by the use of scientific methods: the problem was the development of a practical photo imaging system not involving silver halide. He reviewed the problems that such a topic presented and described a system based on aromatic aldehyde - leucodye-photo-oxidation with which some success had been achieved. Although the speed of the resultant film was well below that of silver halide photography it is fast in comparison to other non-silver systems, has almost molecular resolution, and gives an image immediately on exposure.

Carrying on the theme of image forming processes, Dr. P. GILMAN (USA) described his speciality of spectral sensitizing dyes and how these could be used in a practical sense. Indeed he pointed out that spectral sensitization of silver halide emulsions out to the infra red region had been achieved. Dr. GILMAN works for the Kodak Company and so his lecture was superbly illustrated by numerous colour slides which aided considerably the understanding of the details of the research involved in this topic.

The pronounced differences observed between photoreactivity in solution and in organized monolayer assemblies were described for several systems by Prof. D. G. WHITTON (USA). Many of these differences can be ascribed to packing phenomena and to restrictions on diffusion and molecular motion in the assemblies. He pointed out that *cis* - *trans*-photoisomerization, ligand photo ejection, excimer and photodimer formation, and electron transfer reactions are subject to strong environmental influences in the assemblies. His description of the photo-cleavage of water mediated by a layer-bound excited state of a surfactant ruthenium bipyridyl complex attracted great interest as the reaction has been found to proceed smoothly in sunlight and appears to represent a rather efficient energy-storage process. The final Plenary Lecture was fittingly presented by Prof. H. E. ZIMMERMAN (USA) who has contributed an enormous amount to the understanding and interpretation of photochemical reactions as well as the discovery of new photochemical processes. He described the technique of single photon counting with simulated deconvolution and outlined its application to deal with the oscillation of excitation energy between two chromophores attached to distant bridgehead positions of a bicyclo[2.2.2]octane unit. A new cyclopentadiene synthesis from light-induced rearrangement of vinylcyclopropenes was also described.

Of the 112 contributed papers received by the Organizers, 56 were presented at the Symposium in parallel sessions and were arranged

where possible to complement the Plenary Lectures. The volume of the abstract of these papers was dedicated to Dr. ERNST KOERNER von GUSTORF who died in September, 1975.

The evenings at the Symposium were devoted to workshop sessions which appeared to have been very successful as judged by the size of the attendance and the number of active participants in the discussions. Subjects reviewed, discussed, and argued over in these sessions were the classification of photochemical reactions, polymer photochemistry, exciplexes and charge transfer intermediates, processes from upper excited states, organometallic and inorganic photochemistry, instrumental techniques, and photochemistry of functional groups containing nitrogen and oxygen.

During the time of the Symposium the European Photochemistry Association held its General Council Meeting: the new Executive Committee was elected and the results of the election of members to the Standing Committee were reported.

Although the Symposium Committee had organized a full scientific schedule there was still adequate time for participants to discuss informally each other's problems and to gain from their experiences. A full social programme was also available and one afternoon was free from scientific sessions for all to have the opportunity to visit the 'Calanques' by boat and view the attractions on the beaches in the South of France!

A. GILBERT

INTERNATIONAL SYMPOSIUM ON ANALYTICAL CHEMISTRY IN THE EXPLORATION, MINING AND PROCESSING OF MATERIALS

Johannesburg, 23 - 27 August 1976

The Symposium was held at the Rand Afrikaans University in Johannesburg, South Africa, and was organized under the sponsorship of IUPAC by the Council for Scientific and Industrial Research in association with a number of South African organizations. Emphasis was on the application of analytical techniques to the analysis of naturally occurring substances, such as ores, minerals and coal, and to the various processed products of these materials such as concentrates and metals. A special feature was the large number of papers that dealt with the precious metals and geochemical exploration. Included were also papers on automation and reference samples.

The Symposium was attended by 366 delegates of which 82 came from abroad. Some of the delegates were specially invited to deliver plenary papers covering the main topics of the Symposium and there were 112 research papers presented in 5 parallel sessions. Seven periods each of an hour were devoted to discussion, the subjects being reference materials, coal, precious metals, ferrous and non-ferrous metals, automation, geochemical exploration and mining, and general analytical techniques. The 16 plenary lectures will be published in 1977 in an issue of the IUPAC journal *Pure and Applied Chemistry*, and also as a separate symposium volume by Pergamon press, Oxford. A 696-page book 'Extended Abstracts' has also been published by the organizers.

In a key-note lecture, Dr. R. E. ROBINSON dealt with the renaissance of analytical chemistry during and following World War II, a feature of which was the collaboration of the physicist and electronic technicians with the chemist giving rise to what may appropriately be termed analytical sciences rather than analytical chemistry. He also dealt in detail with the costs and benefits of research work in the analytical sciences and emphasized that analysts should undertake cost-benefit analyses more frequently.

Geochemical Exploration

Prof. WEBB's lecture dealt with the analytical requirements in exploration geochemistry. Geochemical prospecting in the modern sense began in the USSR in the mid 1930s using spectrography for the determination of traces of ore elements. In the Western countries rapid colorimetric methods were developed but have now been largely displaced by atomic absorption spectrophotometric methods. Future developments are likely to be the development of computerized multi-element techniques with sophisticated computer programs for processing of the data. These trends were, in fact, reflected in some of the research papers presented: J. I. W. WATTERSON *et al.* described a multi-element neutron activation procedure and showed that element concentration patterns typical of mineralized geological units can be found by multivariate pattern recognition methods.

A. R. BARRINGER'S paper dealt with an airborne exploration technique known as Airtrace that is based upon the multi-element analysis of airborne dispersions of particulates derived from vegetation and soil. The equipment used in the system consists of louvred inertial collectors that extract particles from air-flow of up to 600

cubic meters per minute. An adhesive tape collects the particles and the analysis relies upon evaporation of the samples from the tape using a high powered laser. This material is carried in an argon stream into an inductively coupled plasma where strong spectrochemical emission occurs.

The Geological Survey of South Africa has started a geochemical project whereby it is intended to sample the whole country on a one kilometer grid. D. J. NEL described this project and the main analytical procedure to be used. This consists of an emission spectrograph, a Kessler plasma source and automatic sample changer.

J. N. BARRANDON *et al.* showed that $^{252}\text{Californium}$ can be used as a source for activation analysis of sediments. A description was given by J. J. GURNEY and W. R. O. JAKOB of a mobile analytical unit comprising equipment for grinding of samples and their analysis by atomic absorption spectrophotometry.

As a considerable amount of geochemical data is being acquired during the search for economic mineralization, there is clearly a need for suitable storage of the data. One such system was described by J. P. WILLIS and A. R. DUNCAN. A series of Fortran programs provide the means of storing data, selecting sub-sets of data, for sorting database records on any set of criteria, and for generating a variety of data matrices. The interpretation of chemical exploration data was discussed by C. O. INGAMELLS *et al.* particularly for data that has skewed distribution. With such distribution a double Poisson model is more appropriate than a Gaussian one.

Reference Materials

In a plenary lecture R. E. MICHAELIS discussed the role of standard reference materials (SRMs) in analytical chemistry. In principle SRMs serve as vehicles for transmission of measurements and bring about compatibility within the measurement system. He outlined the preparation of reference samples and their certification, and illustrated the principles by describing the current NBS programme for the preparation of SRMs for the copper industry.

C. O. INGAMELLS and J. C. ENGELS also described the many factors to be considered in the preparation and certification of reference materials for the geological sciences often referring to their own reference sample of biotite. They make a plea for the abandonment of practices such as averaging, elimination of 'outliers', and other

statistical mistreatment of data. Furthermore, fuller information should be given on the certificate of the reference sample regarding the sampling characteristics and minimum subsample weights of the sample to ensure that reference samples will not be misused. F. J. FLANAGAN discussed precision, accuracy and regression lines with respect to reference samples.

W. H. GRIES described a recent technique for the preparation of trace-element reference samples by the technique of ion implantation. The trace elements are atomized and ionized in an ion source of a heavy ion accelerator, separated according to the mass-to-charge ratio, and injected into the metal matrix. The electric matrix is used to calculate the quantity of trace element implanted. The preparation of reference materials for rock analysis in the form of glasses was described by K. KRÖGER and F. BLUM, and G. ROSSI gave an account of the Euratom (Ispra) program for the preparation of reference materials for zinc and lead ore concentrates.

Automation

In a plenary lecture an account was given by A. H. SMALLBONE of automated on-line analysis for controlling industrial processes. Computers are essential for continuous operation of on-line systems supplying information to a larger supervisory control computer. The control of the sampling system can be part of the program and should include diagnostic routines and process alarms. In present day systems all the desired information, or status of the process, can be displayed in colour on a large television screen. A. S. M. de JESUS dealt with the contribution of nuclear techniques to on-line and just-off-line analyses and illustrated this with the determination of fluor-spar in ore slurry, the determination of ash in coal by beta back-scattering and the monitoring of a zinc coating on steel wire during manufacture.

Several descriptions of automation equipment were given, including an automated sample changer for liquid and solid materials for use in neutron activation analysis (A. H. ANDEWEG), a computer automated diffractometer (C. FRICK), automated flame and furnace atomic absorption spectrophotometers (Z. GROBENSKI *et al.*) and X-ray fluorescence analysers for the automation of the analysis of geological samples (B. P. FABBI) and as an aid in the automation of pellet-making plants for use in pig iron production (H. MULLER and H. NEFF).

Coal

There were two plenary lectures on the subject of coal: W. HOOK dealt with primary coal, mentioning the three main parameters where analysis and testing are required, namely, chemical quality (ash, sulfur, moisture and volatile matter), physical properties (size, hardness) and fundamental properties (petrology, plasticity and fluidity properties). G. KÖLLING treated the analytical requirements of the products of coal, such as coke, tars and gases. Energy dispersive X-ray fluorescence analysis (J. A. COOPER *et al.*) is a modern technique being used for the analysis of coal.

R. J. WATLING and H. R. WATLING pointed out that several trace elements in coal volatilize on combustion of coal and as coal is consumed at the annual rate of 2.5×10^9 metric tons it could be a major contributor to pollution. They claimed that trace-element concentrations for several elements in coal are higher than usually reported because of loss of these elements during the ashing of the coal which is the usual step in the preparation of the sample for analysis. To overcome these difficulties they advocated an emission spectrographic method in which the analysis is done on the unignited coal. J. H. le ROUX showed how instrumental analytical methods, such as X-ray diffraction and nuclear magnetic resonance, are being applied to paraffin waxes which are important products of the Fischer-Tropsch synthesis.

Metals

In the section on metal analysis, R. A. WHITE, in a plenary lecture, described techniques that are now most favoured for the analysis of non-ferrous metals. Direct reading emission spectrometry has to a large extent displaced the photographic recording techniques. In the aluminium industry the technique is usually a point-to-plane technique in air, but more recently a nitrogen purge gap has been introduced to alleviate interelement effects. The determination of impurities in copper metals, copper alloys, lead and zinc are also commonly done by direct reading emission spectrometry. X-ray fluorescence is the major technique for copper alloys and lead alloys and atomic absorption appears to be used largely as a back-up to the multi-element techniques. The use of the Grimm glow discharge and inductively coupled plasma sources are now receiving attention.

K. D. OHLS described the role of analytical chemistry in the ferrous industry. In this plenary lecture emphasis was placed on the

speeding up of spectrochemical analysis. It is now possible to achieve analysis times of 30 seconds for 20 - 30 elements. The use of the scanning electron microscope in conjunction with the EDX energy dispersive X-ray analyser for the determination of major and minor elements in steels was described by F. BLUM. B. T. EDDY *et al.* discussed the determination of impurities in zirconium metal by instrumental neutron activation analysis; R. A. KRUGER and L. R. P. BUTLER the analysis of brass by emission spectroscopy using the Grimm glow discharge source; B. D. NELSON the spectrochemical analysis of wire; and R. C. MALLETT the determination of impurities by flameless atomic absorption spectrophotometry in selenium and tellurium.' It was shown by R. A. PACEY that differential thermal analysis is a powerful tool for the investigation of the thermodynamics of metal systems. He illustrated the use of this technique for the study of carbide formation.

Precious Metals

Historically most noble metal analytical work has been done by fire assay and J. C. van LOON remarked that this situation remains true today. He quoted F. E. BEAMISH who stated that during 40 years of research he had not experienced a single example of failure of the classical assay to find a payable ore. A major reason for the continuing popularity of fire assay is the large sample that can be taken for analysis thereby minimizing the effect of sample inhomogeneity. It is in the measuring step after collection of the precious metals that modern techniques have had an impact. In this context reference was made to atomic absorption spectrophotometric procedures that have tended to replace gravimetric and colorimetric procedures, and to neutron activation analysis which finds favour for very low concentrations of precious metals.

Some of the modern trends in precious metal analysis were dealt with in the research paper session: C. S. ERASMUS described the determination of noble metals by neutron activation analysis after a preliminary collection of the precious metals on chelating resins such as Sraffion and Monivex; K. DIXON *et al.* the determination of osmium by spectrophotometry after its separation from base metals by extraction into toluene from nitric acid solution; A. KETTRUP, the use of a substituted acetoacetanilide as a selective spectrophotometric reagent for palladium, and P. R. LOWE *et al.* the determination of silver in bullion by an automated energy dispersive X-ray spectrometric method.

Several studies were described of liquid - liquid extraction procedures for the separation of precious metals either as a group or separations within its group. For example, A. DIAMANTATOS and A. A. VERBEEK showed that the separation of platinum from palladium, and rhodium from iridium, can be achieved with the use of diphenylthiourea. The extraction of noble metals with isothioronium and related compounds and with di-n-octyl sulphoxide was described by A. J. RADFORD *et al.* It was shown that back-extraction from the organic phase of one of the isothioronium extractants can be avoided if zinc dithiocarbamate is added to the organic phase, the dithiocarbamate acting as an efficient releasing agent (D. J. NICOLAS and E. A. JONES).

The determination of impurities in refined precious metals received considerable attention. Thus, V. M. LeROY and A. J. LINCOLN described the spectrographic determination of 28 impurities in refined ruthenium and iridium, the main feature of the method being the addition of germanium to the charge to effect the formation of a quasi-alloy system within the sample electrode, which results in the simultaneous volatilization of the impurity elements. A paper by P. F. S. JACKSON *et al.* also described the determination of impurities in the precious metal by use of the spark source mass spectrographic technique. Impurities in silver can be determined by X-ray fluorescence analysis (F. T. WYBENGA and L. R. P. BUTLER) or by use of a Grimm glow discharge source (N. P. FERREIRA and L. R. P. BUTLER).

The Grimm glow discharge source was described by P. PILLE *et al.* for the determination of impurities in gold metals and the direct determination of gold. Results showed that 78.7 per cent of the gold samples analysed fall within ± 0.01 per cent of the fire assay method and the standard deviation achieved is 0.006 per cent compared to 0.005 per cent of the fire assay. In a paper by R. ROLLE and P. J. D. LLOYD, a description of an instrument was given for determining gold *in situ* at the rock face in an underground mine. ^{109}Cd was used as the source for excitation by gamma rays.

Ores

In the plenary lecture R. H. GIJBELS outlined the role that activation analysis can play in the analysis of ores, minerals and rocks. Emphasis was given to applications using isotopic neutron sources, the ad-

vantage being that these sources have high stability and are applicable to large samples. Many elements can be determined by photo-activation analysis with Bremsstrahlung radiation from electron accelerators. Charged particles with energies in the MeV range can be used to induce resonant nuclear reaction, coulomb excitation, and X-ray emission.

Instrumental neutron activation analysis using computerized Ge - Li gamma-ray spectrometry is becoming a routine method for multi-element analysis of rocks. Furthermore, the application of neutron activation analysis can be very much extended by introducing group separations. The use of an isotopic neutron source in ore analysis was described by J. OP de BEECK *et al.* M. C. B. SMIT discussed the determination of uranium in low grades ores by delayed neutron counting, a method that is very rapid and free from interference. The use of this technique for the determination of uranium in natural waters was described by R. J. N. BRITZ and F. M. SUNDE. J. I. W. WATTERSON *et al.* discussed the role that neutron activation could play in the mineral processing industry. K. DIXON reviewed the techniques that can be used for the analysis of base metal sulphide concentrates showing that atomic absorption spectrophotometry, spectrography using the induction coupled plasma torch, or the d.c. arc, and instrumental neutron activation analysis, all have a role to play, but that spectrographic methods in practice offer the widest elemental coverage.

Some of the applications of X-ray fluorescence with radioisotope sources in combination with filters for element selection were discussed by K. F. BURNETT, and G. DOMEL dealt with the application of this type of analysis to the monitoring of copper, zinc, and lead in the processing of their sulphidic ores. It was pointed out that satisfactory results could be obtained if the composition of sample material does not vary too widely so that calibration standards could be matched to the sample in respect of particle size, spectral interference and mineralogical composition. The use of the X-ray fluorescence technique for the determination of uranium and thorium in mine plant control and prospecting samples was described by F. C. BAUMGARTNER *et al.* The method used copes with samples whose composition varies widely and where tens of thousands of samples per year have to be analysed by relatively unskilled labour. The special problem of determining refractory oxide elements in high purity uranium compounds was discussed by A. E. SPARROW and a satisfactory emission spectrographic method to overcome this problem was described.

Silicates

There were several papers devoted to the analysis of silicate materials using several techniques, for example, energy dispersive X-ray fluorescence (J. P. WILLIS and A. R. DUNCAN; C. FRICK and M. D. KÖHLER), alpha-particle induced prompt gamma-spectrometry for fluorine (I. S. GILES and M. PEISACH), mass spectrometry (P. F. S. JACKSON and A. STRASHEIM), and neutron activation analysis for rare earth elements and barium (W. P. V. LOO and H. W. FESQ).

A more time-consuming procedure but, nevertheless, of importance as a reference method that does not require reference samples, was described by A. H. VICTOR *et al.* The method is based on the use of ion exchange resins for separation of trace elements in rocks followed by the determination of the elements by atomic absorption spectrophotometry and molecular spectrophotometry.

Atomic Absorption Spectrophotometry

A. WALSH reviewed new developments in atomic absorption and atomic fluorescence spectrophotometry. He stated that the most important advance during the past few years had been the use of carbon rod furnaces. Also a notable advance has been the combination of the techniques of gas and liquid chromatography with furnace analysers as detectors. The most successful approach to the direct analysis of solid samples, particularly metals and alloys, is that in which the atomic vapour of the sample is produced by cathodic sputtering. He mentioned that, puzzling as it may be, the interest in atomic fluorescence is diminishing. However, it has recently been demonstrated that fluorescence measurements on atomic vapours produced by cathodic sputtering provide a promising method for the analysis of metals and alloys. There has been renewed interest in the use of resonance spectrometers. Whereas in the past the resonance detector had been produced by electrical heating of the appropriate element or by cathodic sputtering, it is now possible to use a flame as a detector by simply spraying a pure solution of the given element into the flame. Such a flame has the outstanding advantage over previous types of resonance detectors because of the ease of changing the detector for one element to another.

The use of a micro-processor with a program for the automatic correction of the curvature of calibration lines results in improvement on the precision of atomic absorption spectrophotometry (G. E. PETERSON). Partial shielding of the flame decreases the dynamic

flame noise in atomic absorption spectrophotometry and hence leads to an increase in the instrumental precision attainable with this technique (J. T. H. ROOS). An evaluation of different types of continuum sources in atomic fluorescence spectrometry was made by H. G. C. HUMAN. This is of importance because multi-element analysis is possible with a continuum source. At present the 150 W Eimac lamp seems to be the best continuum source. A study of the metal interferences of alkaline earth elements was described by I. A. VOINOVITCH *et al.*

Optical Emission Spectroscopy

There were two plenary papers on optical emission spectroscopy. K. LAQUA described some of the recent developments in this field omitting induction coupled plasma sources which was dealt with in the second plenary lecture. Improved power of detection, higher precision and better control of sample evaporation has resulted from the application of homogeneous and inhomogeneous magnetic fields to the electrical d.c. arc. The Gordon arc has led to the development of universal methods for the analysis of small liquid samples. The direct formation of an aerosol from solid samples by means of a d.c. arc in an inert atmosphere is an important development for the analysis of bulk samples remote from the spectrograph. The work on photo-electric detectors such as the Vidicon tube may lead to new instruments that combine the virtues of photographic and electrical measuring techniques. Resonance fluorescence detectors are also likely to have a major impact on spectrochemical analysis.

In the second plenary lecture on this subject, V. A. FASSEL described the unique properties of the argon plasma formed at atmospheric pressure and sustained by inductive coupling to high frequency magnetic field—the ICP source as it is generally referred to. He pointed out that the ICP, although remarkably free of interelement interferences, could be subject to subtle spectral or radiation interferences. He maintained that the unequivocal identification of these possible spectral line and background interferences is greatly facilitated if reference samples containing all constituents except the analyte are available, and that these reference samples are essential for the preparation of reference calibration samples.

The application of a high power ICP system to the determination of trace and minor elements in sulphide concentrates was described by A. E. WATSON and G. M. RUSSELL. In this study variations in the

concentration of the matrix element were not observed to have any effect on the minor and trace elements. Using a low power input, R. H. SCOTT and M. L. KOKOT in their work on the determination of uranium in exploration samples found that the gradient of the calibration graphs was affected by the calcium and iron concentration and it was therefore necessary to introduce a correction for these elements.

There were several papers on improvements and innovations in more conventional emission spectrochemical analysis, namely a d.c. arc source which controls the arc temperature (R. J. DECKER), a dynamic background corrector (P. B. ZEEMAN), and multiple grading systems (J. BAIRD *et al.*). W. TRUTER described computer programs for treating regression functions and showed how they can easily be applied to the data from multi-element analysis in complex matrices.

Mass Spectrometry

There were two papers on the ion microprobe mass analyser. P. A. BÜGER and J. H. SCHILLING showed that this technique is a powerful tool for studying the surface as well as the bulk material of iron and steel samples. Apart from its very high sensitivity for many elements use can be made of its ability to detect even hydrogen and its compounds. As shown by J. H. SCHILLING and P. A. BÜGER the capabilities of this instrument can be furthered by use of a computer for the on-line control and data collection and the processing of the data.

Nuclear Techniques

Nuclear techniques received much attention. R. E. van GRIEKEN discussed proton induced X-ray emission and showed that it is a useful technique for determining the Zr/Hf ratio in zircon. Nuclear backscattering was described by M. PEISACH and V. W. WILSON, a technique that was shown to have application in the tinplate industry. The technique of prompt charged particle analysis was described by C. OLIVIER *et al.* and also its application to the determination of nitrogen in steel. The dispersion of charged particle induced nuclear cross-sections by the coulomb barrier can be utilized for analyses as was discussed by V. von WIMMERSPERG *et al.* This technique has been applied to the determination of impurities in platinum metal. D. C. G. PEARTON showed that a desk-top programmable calcula-

tor can be used for the rapid evaluation of gamma spectroscopy data including peak area determination and decay corrections.

X-ray Fluorescence

In a plenary lecture R. JENKINS surveyed recent developments in wavelength and energy dispersive spectrometry. Significant progress has been made in the formulation of algorithms for the conversions of characteristic wavelength intensity into concentration, and routine analysis without the use of interelement correction samples is close to becoming a reality. The new acid phthalate crystals provide for better sensitivities for elements of low atomic numbers.

The ability to acquire the total emission spectrum simultaneously is a feature of energy dispersive X-ray analysis but this technique still lacks sensitivity for elements of low atomic numbers. Improvements can be expected with the newer instruments which include secondary fluorescence/filter combinations which permit a selection of a wide range of excitation conditions. Although this system is slower and also more costly, sensitivity and precision are greatly improved. Mini-computer development has continued to influence the design of both wavelengths and energy dispersive spectrometers and the recent development of the floppy disc system is likely to enhance this trend.

The use of high energy sources such as a beam of protons promises to widen the application of X-ray fluorescence analysis. However, the greatest obstacle to accurate X-ray analysis is the difficulty of preparing the sample such that it is sufficiently homogeneous over the analysed depth. This depth for elements of low atomic number is only a few microns.

In the session on X-ray fluorescence analysis that have general application, C. E. AUSTEN described a single standard calibration method. Three intensity measurements are required, namely, those for the standard, for a mixture of the standard and the sample, and for the sample. Calibration, matrix correction and the calculation of the concentration in the sample are achieved by substitution in a simple equation of those intensities and the mass fraction of the sample in a mixture of the standard and the sample.

A new method for correcting for instrumental drift was described by A. R. DUNCAN and J. P. WILLIS. In the attempt to minimize matrix and mineralogical effects, C. van ZYL *et al.* recommended very fine grinding of the sample in acetone, together with the heavy absorber. This procedure is applicable to samples that are not readily

amenable to fusion such as coal and base metal sulphides. N. R. COMINS described the use and application of the scanning electron microscope/energy dispersive X-ray analyser.

In a plenary lecture which opened the session on the more chemically orientated techniques H. M. N. H. IRVING discussed the place of classical methods of analysis in the present-day industrial laboratory but stating in his prefatory remarks that to treat the physical methods of analysis separately from the older 'classical' method is historically incorrect and, as far as the practising analyst is concerned, irrelevant. Many of the so-called modern techniques are, in fact, over a hundred years old. Where classical methods of analysis demand a high order of experimental skill there is every justification to change to an instrumental method notwithstanding the high cost of modern instrumentation, but when analytical control needs only to show how a sample conforms to or deviates from an accepted norm, a simple titrimetric method may be all that is wanted.

Chemical Techniques

In the research paper session on 'chemical' techniques, the application of three phase liquid - liquid extraction to the separation and concentration of metals was discussed in a paper by D. J. NICOLAS. In this technique aqueous and organic solutions equilibrate to give two distinct organic phases, the one containing the desired elements being of very small volume. The application of this procedure to the concentration of noble metals and the determination of trace elements in nickel refining solutions and base metal sulphide concentrates was described. Solvent impregnated resins that are simple to prepare were shown to be very useful for element separations in a paper by A. WARSHAWSKY *et al.*

In modern liquid chromatography the chemical separation step is integrated with a detection system to form one unit. Such an instrument and its applications was described by J. S. FRITZ in his plenary lecture on chromatography in the analysis of inorganic materials. Columns for the separation step can consist of organic solvents supported on beads on inert material, porous resins with appropriate functional groups, or chelating ion exchange resins. Spectrophotometric detectors can be used (in aqueous hydrochloric acid media approximately 35 elements can be detected by the absorption of ultra-violet light by their chloride complexes) or, alternatively, use may be made of electrochemical detectors. A recent example of the latter is a

system in which there are two ion exchange columns—one for the separation of the elements and the other for removal of the eluent ions so that a conductivity detector can be used.

Laboratory Management

In a paper on laboratory management R. W. YERBURY defined the manager's job and gave suggestions on how to treat the staff and control the budget. S. J. J. GELDENHUIS in the same session discussed the design and operation of a coal laboratory that has to deal with a very large number of samples.

T. W. STEELE

FORTHCOMING IUPAC-SPONSORED SYMPOSIA

VI INTERNATIONAL SYMPOSIUM ON MAGNETIC RESONANCE

Banff, 21 - 27 May 1977

This Symposium has been sponsored by the International Society for Magnetic Resonance in collaboration with IUPAC, National Research Council of Canada, Canadian Association of Physicists, Spectroscopy Society of Canada, the Universities of Calgary, Regina, Saskatchewan and Waterloo and the International Union of Pure and Applied Biophysics. The Symposium will be held at the Banff Springs Hotel (Banff, Alberta, Canada) located in the beautiful Canadian Rocky Mountains.

Scientific Programme

The scope of the Symposium will cover all disciplines of magnetic resonance (e.p.r., n.m.r., n.q.r.), with sessions on both theoretical and experimental aspects thereof. Topical sessions in Physics, Chemistry and the Biosciences are planned to be organized. Contributed papers dealing with theory, applications and instrumentation will be accepted for consideration. Contributors should prepare abstracts on special paper available from the address given at the end of this announcement. Detailed instructions on preparing and submitting contributed papers will be sent to all persons who indicate their desire to submit a paper. Two parallel sessions, including 50 minute keynote lectures, 20 minute topical presentations and poster sessions will be held. Single page abstracts of all selected papers will be printed and distributed in bound form to all registered delegates at the time of the Symposium. The official languages of the Symposium are English and French; no simultaneous translation facilities will be available.

The following scientists have accepted invitations to present invited papers:

Keynote Lectures

P. W. ATKINS
R. R. ERNST
J. S. HYDE
K. U. INGOLD
D. KIVELSON

P. MANSFIELD
H. M. McCONNELL
J. A. POPLÉ
J. S. WAUGH

Topical Lectures

R. BLINC
P. DIEHL
D. M. GRANT

C. A. JUTCHISON, Jr.
J. JEENER
R. E. RICHARDS

Poster Presentations

F. A. L. ANET
E. D. BECKER

R. K. HARRIS
P. C. LAUTERBUR

Correspondence

Enquiries and correspondence concerning the above Symposium should be addressed to:

R. W. DOLAN, Executive Secretary VI-ISMIR
c/o National Research Council of Canada
Ottawa, Canada K1A 0R6
Tel: (613) 993-9009 - 993-9628

INTERNATIONAL SYMPOSIUM ON MICROCHEMICAL TECHNIQUES 1977

Davos, 22 - 27 May 1977

The International Symposium on Microchemical Techniques to be held in Davos (Switzerland) will follow the same pattern of IUPAC-sponsored symposia on the subject held previously at Graz, Vienna, Birmingham and Penn State University. The symposium is being organized by the National Chemical and Analytical Societies of Switzerland. Davos can be reached in approx. 3 hours by train or car from Kloten Intercontinental Airport, Zürich. 5 classes of hotels and boarding houses are available at low-season prices.

Scientific Programme

The topics covered by the Symposium will include new or optimized chemical and physical methods for qualitative and quantitative analysis of elements, organic and inorganic compounds, with reference either to very small samples (*Microanalysis*) or to very low concentrations (*Trace analysis*), concentration profiles, microprobe and surface analysis, and microchemical preparations, and also the applica-

tion of these techniques to chemistry, biochemistry, clinical chemistry, pharmacy, environmental studies, forensic science, materials science, geochemistry, cosmochemistry, archaeology, etc. Special lectures, setting the 'theme' of the Symposium, will be given by E. O. FISCHER (FRG), R. JUNGK (Austria), and W. SIMON (Switzerland), on the significance of analysis in modern society, research, technology and the environment.

Plenary lectures would be presented at the Symposium by the following:

R. BELCHER (UK)	W. MERZ (FRG)
K. BEYERMANN (FRG)	E. SAWICKI (USA)
R. A. CHALMERS (UK)	G. TÖLG (FRG)
E. C. HORNING (USA)	Yu. A. ZOLOTOV (USSR)
J. F. K. HUBER (Austria)	

These papers will be published in due course in the IUPAC journal *Pure and Applied Chemistry* and possibly also as a separate Symposium volume by Pergamon Press Ltd., Oxford.

Contributed papers will be allocated 15 minutes for presentation, followed by 5 minutes for discussion. Authors offering a paper for presentation should submit a summary, typed double-spaced in a type area of 19 × 25 cm on A4 paper. The summaries must be in English or German and sent to Dr. W. MERZ, c/o BASF Aktiengesellschaft, D-6700 Ludwigshafen, FRG. The papers must deal with previously unpublished work and after the Symposium may be published at the authors' discretion. Contributed papers will be arranged in parallel sessions with introductory 'theme' lectures. To accommodate as many papers as possible 'Poster' presentation will be used.

Analytical instruments and chemical products will be exhibited by manufacturers; scientific publishers will also present the latest literature on a wide range of subjects.

Correspondence

Enquiries and correspondence concerning the Symposium should be addressed to:

ISM Secretariat
CH-8606 Griefensee-Zürich, Switzerland
Phone: (01) 876311, Telex 54592

V INTERNATIONAL CONFERENCE ON CRYSTAL GROWTH

Boston, 17 - 22 July 1977

The Conference to be held in Boston, Massachusetts, USA during 17 - 22 July 1977 is being organized by American Association for Crystal Growth under the sponsorship of International Organization for Crystal Growth, International Union of Pure and Applied Chemistry and International Union of Crystallography.

Scientific Programme

The Conference will cover all aspects of crystal growth theory and mechanisms, techniques of crystal growth, growth of materials for research and industrial applications, and crystal characterization will be covered in invited and contributed presentations, continuing the traditions of the previous four conferences. New theories and techniques, novel apparatus, and advanced characterization methods will be emphasized.

It is anticipated that special sessions will be devoted to modern aspects of crystal growth, including theory and computer simulation, use of molecular beams, microgravity growth, crystals for energy conversion and storage, LSI silicon production and perfection. The conventional categories of crystal growth techniques (including Czochralski, Bridgman, zone, flux, solution, hydrothermal, high pressure, vapor, epitaxial, gel, etc.) will be covered as well as crystal morphology and characterization. Also included will be the growth of specific materials for optical, magnetic, semi-conducting, piezoelectric and other studies and applications, as well as crystals of biological and mineralogical interest, eutectics, and composites.

There will be about nine invited plenary talks scheduled for the opening and closing sessions, and as the first talk of the each day. There will be about 24 other invited talks in parallel sessions. In addition, a plenary session and a cinema session are planned for two evenings. Also under consideration is the possibility of 'poster sessions'. English is the official language of the conference; simultaneous translation service will not be available.

Submission of Papers and Publication

A camera-ready one page abstract should be submitted to the Conference Secretariat for those intending to present a paper. A Pro-

ceedings volume will be published which will consist of selected refereed manuscripts. This volume will constitute a special issue of the *Journal of Crystal Growth* and will also be available as a separate cloth-bound book, both published by North-Holland Publishing Company, Amsterdam. Submitted manuscripts will be subjected to standard refereeing procedures.

III International Summer School on Crystal Growth

This Summer School will be held on 10 - 16 July 1977 during the week preceding the Conference on Crystal Growth. The Summer School is under the auspices of the International Organization of Crystal Growth and the International Union of Crystallography. The lectures will be tutorial and will extend to the graduate student level with one advanced seminar presentation each day to provide exposure beyond the tutorial approach to the various subjects. The first day will be devoted to unifying principles of crystal growth. Remaining lectures will cover concepts such as atomic kinetics, phase equilibria, nonstoichiometry, fluid dynamics, and heat flow, as applied to specific growth techniques and control methods. Examples will be presented from applications for classes of materials such as semiconductors, metals, magnetic materials and refractory oxides for lasers and nonlinear optics. The relation of measured properties as well as independent characterization techniques to growth variables will be stressed.

Correspondence

Enquiries and correspondence concerning the Conference should be addressed to:

Dr. K. NASSAU, Secretary ICCG-5
Bell Laboratories
Room 6D-205
Murray Hill, New Jersey 07974, USA

IV SOCIETY FOR ANALYTICAL CHEMISTRY CONFERENCE 1977

Birmingham: 17 - 22 July 1977

The fourth SAC Conference to be held at the University of Birmingham is being organized by the Analytical Division of The Chemical

Society and is sponsored by the International Union of Pure and Applied Chemistry. Accommodation for all participants will be available in the University's modern halls of residence; there will be a limited number of double rooms.

Scientific Programme

The scientific programme will cover all aspects of analytical chemistry and will consist of plenary lectures, invited lectures, contributed papers, including poster presentations, workshops, and specialist sessions organized by the Subject Groups of the Analytical Division of the Chemical Society. The following plenary lectures will be delivered:

Prof. R. BELCHER (UK)	The Resurgence of Analytical Chemistry
Prof. V. A. FASSEL (USA)	X-Ray Excited Optical Luminescence: Present Status and Prospects
Dr. R. P. W. SCOTT (USA)	Highlights from Contemporary Analytical Liquid Chromatography
Prof. Yu. A. ZOLOTOV (USSR)	Hybrid Methods of Analysis

Invited and contributed papers will be arranged in lecture and poster sessions. The following aspects of analytical chemistry will be included: (i) Instrumentation in analysis; (ii) Atomic spectroscopy; (iii) Molecular spectroscopy; (iv) Chromatography and other separation methods; (v) Nuclear and radiochemical analysis; (vi) Thermal analysis; (vii) Microchemical techniques and analytical microscopy; (viii) Electroanalysis, including ion-selective electrodes; (ix) Analysis in the life sciences; (x) Analysis in industry; (xi) Pollution and environment control analysis; (xii) Forensic analysis; (xiii) Newer techniques.

For contributed papers given in lecture sessions, the time available for presentation will be 20 minutes followed by 5 minutes of discussion. The preferred language of the Conference is English; translation facilities will not be available. Contributed papers offered should describe original, unpublished work that leads to the advancement of any of the general topics of analytical chemistry listed above.

Publication

The plenary lectures will be published in *The Analyst*, the analytical journal of The Chemical Society. Other papers can also be submitted to the editor of *The Analyst* where they will be published after the

usual refereeing. Abstracts of all accepted papers will be bound and copies will be distributed to active participants at the registration desk on arrival.

A comprehensive exhibition of manufacturers' equipment will be held during the period of the Conference. Practical demonstrations and discussion will include the following topics:

Dr. G. F. KIRKBRIGHT (UK)	Optoacoustic Spectrometry
Education and Training Group	Teaching Aids
Special Techniques Group	Black Boxes, including a demonstration of computer-linked XRF
Dr. D. BETTERIDGE (UK)	Flow injection analysis and microprocessors
Dr. S. L. BOGDANSKI and	MECA(molecular emission cavity analysis) and candoluminescence
Dr. A. TOWNSHEND	

Correspondence

Enquiries and correspondence concerning the Conference should be addressed to:

The Secretary
Analytical Division, The Chemical Society
Burlington House, Piccadilly,
London W1V 0BN, UK

INTERNATIONAL SYMPOSIUM ON MACROMOLECULES

Dublin, 17 - 22 July 1977

The Symposium will be held at the University College Dublin (Ireland) and has been sponsored by Macromolecular Division of IUPAC, Royal Irish Academy, Institute of Chemistry of Ireland, The Chemical Society, and Plastics and Rubber Institute. Accommodation will be in hotels located close by and also in Trinity College where some residential accommodation is available.

Scientific Programme

Four plenary lectures will be given by the following:

V. A. KABANOV (USSR)	C. G. OVERBERGER (USA)
H. MARK (USA)	H. RINGSDORF (FRG)

The Symposium has been divided into four sections and invited lectures under each section will be presented by lecturers whose names appear under the respective sections

Section I. Homogeneous Polymerization by Anions, Zwitterions and Coordination Complexes

B. L. ERUSSALIMSKY (USSR)	P. SIGWALT (France)
D. C. PEPPER (Ireland)	P. TEYSSIE (Belgium)
T. SAEGUSA (Japan)	

Section II. Fine Structure of Polymers including Biopolymers

F. CIARDELLI (Italy)	D. J. PATEL (USA)
M. GOODMAN (USA)	C. TANFORD (UK)
K. J. IVIN (Ireland)	

Section III. Polymers as Reagents and Catalysts

N. ISE (Japan)	H. MORAWETZ (USA)
J. KALAL (Czechoslovakia)	M. A. WINNIK (Canada)
G. MANECKE (FRG)	

Section IV. Polymer Chemistry in Polymer Engineering

S. L. AGGARWAL (USA)	J. B. DONNET (FRG)
A. W. BIRLEY (UK)	J. G. WILLIAMS (UK)
A. CHALLIS (UK)	

Up to 200 contributed short communications in the above fields will be accepted for presentation in four simultaneous sessions according to their contents. A period of 15 minutes followed by 5 minutes discussion will be allotted to each paper. English is the working language of the Symposium and no arrangements will be made for translation of papers presented in any other language. Contributed papers will be presented throughout the week so that they avoid clashing with plenary lectures or invited lectures in their sections.

Publication

The text of the plenary and invited lectures will be published after the Symposium in the *Journal of Polymer Science - Polymer Symposia Series*. The short communications will be preprinted and available to participants at the Symposium.

Correspondence

Correspondence concerning the scientific programme should be sent to the Chairman of the Symposium:

Prof. D. C. PEPPER
Department of Chemistry, Trinity College
Dublin 2, Ireland
Telephone: Dublin 772971. Telex: 5442 E1

Enrolment forms and enquiries should be addressed to:

Secretariat, MACRO DUBLIN 1977
Institute for Industrial Research and Standards
Ballymun Road, Dublin 9, Ireland
Telephone: Dublin 370101/376474. Telex: 5449 E1

XVII MICROSYMPOSIUM ON MACROMOLECULES-MEDICAL POLYMERS: CHEMICAL PROBLEMS

Prague, 15 - 18 August 1977

This IUPAC-sponsored Symposium will be held under the auspices of Czechoslovak Academy of Sciences and Czechoslovak Chemical Society at the Institute of Macromolecular Chemistry, Prague, Czechoslovakia. English would be the preferred language for all microsymposium contributions and publications.

Scientific Programme

The aim of the Symposium is to hold discussion of general chemical and physical problems connected with the introduction of synthetic polymers in the living body and its response. Particular interest will be devoted to special demands which are to be met in main fields of applications, e.g., in pharmacology, surgery, hematology etc., and an attempt will be made to interpret these demands in chemical and physical terms.

The Microsymposium will be classified under the following topics:

1. *Soluble Polymers*

(a) Chemical and physical properties of water polymers in connection with their biological compatibility; (b) Chemical basis of degradation *in vivo*; (c) Reactive polymers, the attachment of phy-

siological active groups and their controlled splitting; (d) Pharmacologically active polymers: problems in clinical practice.

2. *Crosslinked Hydrophylic Polymers (Hydrogels)*

(a) New medical polymers - new uses. Prosthetic materials; (b) Sustained drug (hormone) release; (c) Tissue adhesives; (d) Sorbents for therapeutical purposes.

3. *Polymer Interfaces*

(a) Surface reactions and modifications; (b) Thrombogenicity and polymer interfaces—Chemical and physical problems; (c) Sorption of proteins, cell adhesion and growth.

The following lecturers have so far accepted invitations to present main lectures. These lectures will be published in due course in the *Journal of Polymer Science, Part C—Polymer Symposia*.

J. D. ANDRADE (USA)
G. BENAGIANO (Italy)
S. P. BRUCK (USA)

B. PHILIPP (GDR)
H. RINGSDORF (FRG)

Scientific sessions will also include contributed short communications, panel discussions and poster contributions. Authors intending to present a paper should first submit a summary of their paper. Summaries of papers will be published in the Programme Booklet to be made available to the participants. Three panel discussions related to individual topics would allow confrontation of views on horizons and limitations of 'tailored' synthetic polymers in human and veterinary medicine.

Correspondence

Enquiries and correspondence concerning the Symposium should be addressed to:

PMM Secretariat
c/o Institute of Macromolecular Chemistry
162 06 Prague 616, Czechoslovakia
Phone: Prague 353 341. Cable: Macro Prague
Telex: 122 019 IMCP C

CHEMICAL EDUCATION IN THE COMING DECADES: PROBLEMS AND CHALLENGES

Ljubljana, 25 - 30 August 1977

This International Conference on Chemical Education is being organized by the Committee on Teaching of Chemistry of IUPAC, UNESCO, University of Ljubljana and Union of Yugoslav Chemical Societies. The participants will be selected from those concerned with the teaching of chemistry at elementary, secondary and higher levels. Accommodation for participants will be available in hotels of different categories and in student hostels. The official languages for the plenary sessions will be English, French and Russian. In group discussions the organizers hope to provide translation facilities also in other European languages.

Scientific Programme

The objectives of the Conference are twofold: (A), to define the major current problems and to consider the future of chemical education in the context of (i) the changing needs and demands of society, (ii) the developing nature and scope of chemical sciences, (iii) students' aspirations and attitudes, (iv) the demands of developing countries; (B), to prepare recommendations for the future of chemical education at all levels.

The programme will be based on the nine sessions each including an introductory presentation related to the objectives, followed by group discussions which will allow full involvement of all participants. The international conference will be followed by a 2 day meeting of the Federation of European Chemical Societies (FECS) Committee on Chemical Education on aspects of European chemical education.

Correspondence

Enquiries and correspondence concerning the Conference should be addressed to:

University of Ljubljana
Department of Chemistry - RCPU, PO Box 18/1
61001 Ljubljana, Yugoslavia

INTERNATIONAL MASS SPECTROMETRY SYMPOSIUM ON NATURAL PRODUCTS

Rehovot, 28 August - 2 September 1977

This Symposium, organized by the Weizmann Institute of Science, will be held in Rehovot, Israel under the auspices of the Israel Academy of Sciences and Humanities, Israel Chemical Society, and under the sponsorship of IUPAC. Hotel accommodation has been reserved in Tel-Aviv, which is only a 30 minute drive from Rehovot. Transportation to and from Rehovot will be provided by the Organizing Committee.

Scientific Programme

The scientific programme will cover the main aspects of Natural Mass Spectrometry such as the following topics: (i) Structure determination of complex molecules (steroids, vitamins, nucleic acids, alkaloids, etc.) including Fragmentation mechanisms; (ii) Elucidation of metabolic pathways; (iii) Stable isotope tracers; (iv) Computer interpretation of mass spectra; (v) Stereochemical information from mass spectra; (vi) Ionization techniques; (vii) Medical applications of mass spectrometry.

The following invited lectures will be presented at the Symposium and will be published in due course in the IUPAC journal *Pure and Applied Chemistry*:

K. BIEMAN (USA)

C. DJERASSI (USA)

M. GREEN (USA)

G. SPITELLER (FRG)

H. BUDZIKIEWICZ (FRG)

M. FETIZON (France)

F. W. McLAFFERTY (USA)

D. H. WILLIAMS (UK)

Contributed papers will be divided into a number of sessions. At each session 10 - 15 minutes will be provided for the presentation of each paper and 5 minutes for discussion. There will be 2 invited lectures of 50 minute duration.

Correspondence

Enquiries and correspondence concerning the Symposium should be addressed to:

The Organizing Committee

Dr. Z. V. I. ZARETSKII

Isotope Department

The Weizmann Institute of Science

Rehovot, Israel

V INTERNATIONAL CONFERENCE ON VACUUM ULTRAVIOLET RADIATION PHYSICS

Montpellier, 5 - 9 September 1977

The Conference is being organized by the Laboratoire des Interactions Moléculaires et des Hautes Pressions and Laboratoire LURE (Synchrotron Radiation Laboratory, Orsay) and has been sponsored by IUPAC, CODATA, European Physical Society and Société Française de Physique. The Conference will take place at the campus of the Université des Sciences et Techniques du Languedoc, located at about 5 kilometers from Montpellier (France). Earlier Conferences in this series were held at Los Angeles (1962), Gatlinburg (1968), Tokyo (1971) and Hamburg (1974). About 250 single rooms have been reserved in the students' halls of residence, close to the Conference building, for which priority will be given to the first applications made. Accommodation can also be found in Montpellier hotels, a bus service will be organized.

Scientific Programme

The Conference will cover the following topics, with emphasis on frontier subjects such as atomic effects in solids, correlation effects, etc.

1. *Atomic and Molecular Physics*

(i) Atomic and molecular spectroscopy; (ii) Photodissociation and photoionization; (iii) Coherent radiation; (iv) Electron correlation effects and R-Matrix calculations; (v) Atomic effects in solids.

2. *Solid State-Surface Physics*

(i) Optical absorption, reflexion and emission from valence and core shells in solids; (ii) Surface states and adsorbates; (iii) Correlation between photo-emission and optical spectroscopy; (iv) Final state spectroscopy, constant initial state spectroscopy, partial and full yield spectroscopy.

3. *Instrumentation and Applications*

(i) Methodological and instrumental innovation; (ii) Calibration and data compilation; (iii) Photochemistry, upper atmosphere phenomena; (iv) Soft X-ray lithography; (v) Biological investigations.

Each session will begin with Progress Reports and Survey Papers, followed by contributed papers. Selected papers will be presented

either orally or in poster sessions. The Conference languages are English and French; no simultaneous translation will be provided.

Publication

The book of extended abstracts will be published by the organizers from the authors' abstracts typed in the camera-ready form. This Conference book will be available to each participant at the beginning of the Conference. Full text of Progress Reports and Survey Papers will be published in an issue of the *Journal de Physique*.

Correspondence

Enquiries and correspondence concerning the Conference should be addressed to:

Dr. M. POUEY
Executive Secretary 'VUV 5'
CNRS, 1, place A. Briand
92190 Meudon (France)
Phone: 027 75 50, Ext. 2170 or 2037
Telex: LABOBEL 204135 F

VIII INTERNATIONAL CONFERENCE ON ORGANOMETALLIC CHEMISTRY Kyoto, 12 - 16 September 1977

The Conference will be held in the Kyoto International Conference Hall, Kyoto (Japan) and will be organized by Chemical Society of Japan, Catalysis Society of Japan, Society of Polymer Science, Japan and Society of Synthetic Organic Chemistry, Japan, under the sponsorship of the International Union of Pure and Applied Chemistry.

Scientific Programme

The scientific programme of the Conference will include two opening lectures and 13 session lectures as well as approx. 160 contributed papers. The following lecturers have accepted invitations to present the opening and session lectures. The opening and session lectures will be published in the IUPAC journal *Pure and Applied Chemistry*, and also as a separate Conference volume by Pergamon Press, Oxford.

Opening Lectures

R. HOFFMAN (USA)

Theoretical Aspects of the Coordination of Small Molecules to Transition Metal Centers
Organotransition Metal Compounds as Intermediates of Homogeneous Catalytic Reactions

G. WILKE (FRG)

Session Lectures

R. BAU (USA)

Neutron Diffraction Studies of Metal Hydride Complexes
Synthesis and Reactivity of Carbon-bonded Transition Elements

F. CALDERAZZO (Italy)

H. C. CLARK (Canada)

Isocyanide, Carbene, and Related Chemistry of Palladium (II) and Platinum(II)

M. L. H. GREEN (UK)

Studies of Synthesis, Reactivity and Mechanisms in Organomolybdenum and Tungsten Chemistry

R. F. HECK (USA)

New Applications of Palladium in Organic Syntheses
Photolysis of Organopolysilanes. Generation and Reactions of Silicon - Carbon Double-bonded Intermediates

M. F. LAPPERT (UK)

A. NAKAMURA (Japan)

Unusual Metal Alkyls
Enantioselective Reactions through Chiral Metal - Carbene Intermediates

J. F. NORMANT (France)

Stoichiometric versus Catalytic Use of Copper(I) Salts in the Synthetic Use of Main Group Organometallics

O. A. REUTOV (USSR)

Mechanisms of the Substitution Reactions of Non-transition Metal Organometallic Compounds

H. SCHMIDBAUR (FRG)

Classical and Novel Ylide Systems in Organometallic Chemistry

A. E. SHILOV (USSR)

Activation of Saturated Hydrocarbons by Transition Metal Complexes

M. TSUTSUI (USA)

New Trends in the Chemistry of Organometalloporphyrins

Contributed Papers

The Organizing Committee welcomes contributed papers covering the following categories of organometallic chemistry: (i) Structure and Bonding; (ii) Synthesis; (iii) Reaction and Mechanism; (iv) Organic Synthesis via Metal Compounds; (v) Homogeneous Catalysis; (vi) Biological and Environmental Aspects.

The abstract of a contributed paper must be written within the length and breadth of one page according to a special layout—samples of which can be obtained from the Organizing Committee whose address is given at the end of the announcement. The official language of the Conference is English; simultaneous translation facilities will not be available. The time allowed for each presentation will be 15 minutes followed by a 5 minute discussion period.

Correspondence

Enquiries and correspondence concerning the Conference should be addressed to:

Prof. Y. ISHII
Chairman of VIIIth ICOMC
Faculty of Engineering
Nagoya University
Chikusa, Nagoya 464, Japan

VII INTERNATIONAL VACUUM CONGRESS III INTERNATIONAL CONFERENCE ON SOLID SURFACES

Vienna, 12 - 16 September 1977

This combined meeting will be held at the Congress Centre Hofburg, Heldenplatz, Vienna and is being organized by Österreichische Gesell-

schaft für Vakuumtechnik, Österreichische Studiengesellschaft für Atomenergie Ges. m.b.H. and Technische Universität Wien. These meetings have been sponsored by IUPAC; International Union for Vacuum Science, Technique and Applications; International Union of Pure and Applied Physics; International Atomic Energy Agency; and European Physical Society. The Congress will be held under the auspices of Dr. RUDOLF KIRCHSCHLAGER, Federal President of the Republic of Austria.

Scientific Programme

The objectives of the meetings is to provide a broad forum for the presentation and discussion of new and significant research and development in:

1. Vacuum science and technology
2. Thin films and thin film analysis
3. Surface physics and chemistry
4. Surface analysis instrumentation

In particular, special emphasis will be given to: (i) Vacuum pumps, gas flow; (ii) Measurements of total and partial pressures; (iii) Vacuum problems related to accelerators and nuclear fusion devices; (iv) Industrial and medical applications of vacuum techniques; (v) Preparation and analysis of thin and thick films; (vi) Properties and applications of thin and thick films; (vii) Properties of interfaces in semiconductor electronics; (viii) Electronic properties of solid surfaces; (ix) Surface reactions, catalysis; (x) Adsorption of clean and on practical surfaces; (xi) Interactions of particles and photons with surfaces; (xii) Sputtering and ion implantation; (xiii) Surface analysis methods and instrumentation (AES, UPS, XPS, SIMS, FIM, RBS, ISS) and related techniques.

The following speakers have so far accepted invitations to present invited lectures:

F. ABELES (France)	Properties of Thin Films
L. N. ALEKSANDROV (USSR)	Growth and Structure of Epitaxial Films
A. BENNINGHOVEN (FRG)	Experimental Investigation of Surface Reactions
J. H. BLOCK (GDR)	Chemistry at Solid Surfaces
H. P. BONZEL (FRG)	Physical Aspects of Surface Chemistry

G. COMSA (FRG)	Molecular Beam Scattering at Solid Surfaces
L. ESAKI (USA)	Exploratory Investigation for New Microelectronics Devices
J. FRIEDEL (France)	Binding Energy Calculations of Adsorbed Species
R. HERZOG (USA)	Mass Spectrometry as an Analytical Tool in Vacuum and Surface Physics
W. K. HUBER (Switzerland)	The Measurements of Pressures
H. IBACH (FRG)	Surface Vibrations of Adsorbates
M. KAMINSKY (USA)	The Wall Problem in Fusion Devices
D. A. KING (UK)	Chemisorption Processes at Solid Surfaces
J. KOUPTSIDIS (FRG)	Vacuum Problems of Electron Storage Rings
P. MARK (USA)	LEED Structure Determinations of Atomic Geometry of Semiconductor Surfaces
J. M. MORABITO (USA)	Advances in and Applications of Surface Analytical Techniques in the Microelectronic Technology
F. W. SARIS (Netherlands)	Surface Structure Analysis by Ion Backscattering
S. SCHILLER (Canada)	Ion Deposition Techniques for Industrial Application
J. R. SCHRIEFFER (USA)	Theoretical Description of the Solid Vacuum Interface
R. SHIMIZU (Japan)	Computer Simulation of Sputtering
V. N. SHREDNIK (USSR)	Advances in Surface Characterization with Field Electron and Field Ion Microscopy
R. WECHSUNG (FRG)	Industrial Application of Ion Etching
Chr. WEISSMANTEL (GDR)	Trends in Thin Film Deposition Methods

H. W. WERNER (Netherlands)

Comparison of Thin Film
Analytical Methods

W. D. WESTWOOD (Canada)

Optical Thin Film Waveguides

Authors wishing to present a contribution are requested to prepare an abstract (in English) of no more than 250 words on a special sheet obtainable from the address given at the end of this announcement. Contributions will be presented either orally (15 minutes including discussion) or in the form of poster sessions. Proceedings of the meetings will be published by printing directly from authors' manuscripts.

An International Equipment Exhibition will be arranged simultaneously with the Conference at the Congress Centre Hofburg. Vacuum systems and components, equipment for production of thin and thick films, surface and thin film analysis instrumentation and related products as well as technical literature will be on display.

Correspondence

Enquiries and correspondence concerning the meetings should be addressed to:

R. DOBROZEMSKY
Secretary General
7th IVC & 3rd ICSS
PO Box 300
A-1082 Vienna, Austria

WORLD CONFERENCE ON FUTURE SOURCES OF ORGANIC RAW MATERIALS

Toronto, 10 - 13 July 1978

The Conference sponsored by International Union of Pure and Applied Chemistry, The Chemical Institute of Canada, and American Chemical Society will be held in Toronto, Canada during 10 - 13 July 1978. World leaders from governments, industries and academia will attempt to elucidate and set in perspective those factors which will ultimately determine the sources of organic raw materials necessary to support world chemical industries at the end of this century.

Scientific Programme

The Conference will include plenary sessions in which all the factors involved will be considered, including chemical technology, economics, socio-environmental considerations, and government policies. Three technical programs will examine the following in depth:

1. Fossil hydrocarbons with emphasis on alternatives to petroleum.
2. Renewable resources, including wood and other plant materials.
3. Urban, agricultural and industrial waste.

The Conference is a project of the IUPAC program of Chemical Research Applied to World Needs—CHEMRAWN.

Conference Chairman is W. G. SCHNEIDER, President of the National Research Council of Canada. The Program Committee is headed by Max TISHLER and O. C. J. ALLENBY.

Correspondence

Enquiries and correspondence concerning the Conference should be addressed to:

The Chemical Institute of Canada
906 - 151 Slater Street
Ottawa, Ontario, Canada K1P 5H3
Tel: 613-233-5623

VI INTERNATIONAL SYMPOSIUM ON MEDICINAL CHEMISTRY

Brighton, 4 - 7 September 1978

The 6th International Symposium on Medicinal Chemistry will be held at the University of Sussex, Brighton (UK). Previous symposia in these series were held in Florence (1962), Munster (1968), Milan (1972), Noordwijkerhout (1974) and Paris (1976). The meeting is being organized by the Society for Drug Research under the sponsorship of IUPAC, Federation Internationale Pharmaceutique and the European Federation for Medicinal Chemistry.

Accommodation will be available at a reasonable cost in modern halls of residence of the University. Accommodation will also be reserved at a range of hotels in Brighton (5 miles from the University). The official language of the Symposium will be English; no provision would be made for simultaneous translation.

Scientific Programme

Plenary lectures will be given on each day of the Symposium by world authorities in their respective disciplines. Three parallel sessions of lectures are planned for each day. The following topics will be covered, each programme being arranged by a specialist in the field. (i) Cardiovascular Disease; (ii) Peptides; (iii) Metabolic Processes; (iv) Theoretical Medicinal Chemistry; (v) Neuromuscular Blockers; (vi) H₂ Receptor Blockade; (vii) Bronchial Asthma; (viii) Cyclic Nucleotides; (ix) Dopamine Agonists and Blockers; (x) Cancer; (xi) Prostaglandins and Thromboxanes; (xii) Receptor Differentiation.

To allow the widest dissemination of recent advances in Medicinal Chemistry two extensive poster sessions have been planned. These will relate to the topics covered by the scientific sessions although, in certain cases, work of exceptional interest will be displayed regardless of whether it can be so classified. Abstracts of all posters will be required sometime before the meeting to allow for prepublication in the Symposium Handbook and for vetting by the scientific referees. To allow some idea of how many posters will be displayed, intending authors are requested to indicate this on the provisional application.

Correspondence

Enquiries and correspondence concerning the Symposium should be addressed to:

Symposium Secretariat
VIth International Symposium
on Medicinal Chemistry
31 Plane Tree Way, Woodstock
Oxford OX7 1PE, UK

INTERNATIONAL SYMPOSIUM: THE HARMONISATION OF COLLABORATIVE ANALYTICAL STUDIES

8 - 9 March 1978

Analytical Chemistry and Applied Chemistry Divisions, together with the Section on Clinical Chemistry of IUPAC, are conscious of the important part which applied analytical methods, collaboratively studied on a national or international basis, play in relation to important areas of everyday interest including health and commerce. The subject

is of wide interest at the international level, to trade organizations and intergovernmental agencies and whilst there is a large measure of professional cooperation both within and between these areas there is also some unintended duplication. Except in some limited areas, there is at present no systematic coordination between the various bodies and there is no simple means by which those needing new methods can ascertain whether methods already available will meet their needs.

It is obvious that one small symposium or conference cannot solve all of the problems associated with the choice of agreed analytical methods, including the organization of collaborative analytical studies upon which an evaluation is made. The two IUPAC Divisions propose jointly to call together representatives of the main international bodies who at present sponsor collaborative analytical studies in order to discuss the philosophy of collaborative analysis and the possible harmonisation of the approach to such studies. The meeting will be limited to one or two representatives, by invitation only, from each of about 15 international bodies, including ISO, WHO, IFCC and AOAC in March 1978 and will take the form of a two-day symposium. General introductory papers by IUPAC representatives will be presented on the morning of the first day; brief statements of the interests and analytical programme of the other participants will be presented in the afternoon. It is hoped that the latter statements can be based on documentation provided by the individual participating organizations and circulated in advance to all participants. The following day will be devoted to discussion of the principles of harmonisation of collaborative study, with a final reporting session at the close of the meeting.

Whilst invitations have been restricted to international bodies, IUPAC adhering organizations which have a special interest in the subject are invited to communicate views to IUPAC Executive Secretary, Dr. M. WILLIAMS (IUPAC Secretariat, Bank Court Chambers, 2 - 3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK). Other organizations which sponsor collaborative analytical studies may wish, through their national adhering bodies, to bring matters concerning these to the notice of the meeting. If, during the discussions at the 1978 meetings, it is thought appropriate later (perhaps in 1979 or 1980) to call a larger meeting representative of such national as well international organizations interested in this work, details will be advertised in due course.

H. EGAN

ASSOCIATED ORGANIZATIONS OF IUPAC

V INTERNATIONAL CONFERENCE ON THERMAL ANALYSIS

Kyoto, 1 - 6 August 1977

The Conference is being organized by the International Confederation for Thermal Analysis (an Associated Organization of IUPAC) and will be held at the Kyoto International Conference Hall, Kyoto (Japan). The hall is equipped with up-to-date conference facilities for international meetings.

Scientific Programme

The Conference will be divided into the following sections: (i) Theory and instrumentation; (ii) Inorganic chemistry; (iii) Organic and macromolecular chemistry; (iv) Earth sciences; (v) Applied sciences (building materials, ceramics, etc.); (vi) Calorimetry, reaction and non-reaction.

Contributed papers are invited for presentation at the Conference and should be accompanied by two abstracts. One of the abstracts from contributions will be used for producing a book of abstracts by direct reproduction from authors' abstracts. This book will be supplied to all registrants at the meeting. An exhibition of instruments used in thermal analysis and related techniques will be on view at the conference site.

Correspondence

All correspondence and enquiries concerning the Conference should be addressed to:

The Secretariat ICTA V
c/o Society of Calorimetry and Thermal Analysis, Japan
Daiichi Kanamori Bldg. 1-5-31, Yushima, Bunkyo-ku,
Tokyo 113, Japan
Tel: 03-815-3988 TOKYO.
Telegram: NETSUSOKUTEI, JAPAN

IUPAC PUBLICATIONS

1975-76

A compilation of IUPAC Publications in 1974 was published in *Information Bulletin* Nos. 50/51 (November 1975). The present listing attempts to cover everything issued during 1975-76.

The IUPAC Secretariat would be pleased to receive notifications of any omissions from this listing, especially of translations completed or in process of being prepared of IUPAC nomenclature recommendations.

1975

Pure and Applied Chemistry*

Vol. 41, Nos. 1-2: Specially Invited Lectures from IX International Conference on Chemistry of Natural Products, Ottawa (Canada), June 1974

Vol. 41, No. 3: Plenary Lectures from IV International Conference on Nonaqueous Solutions, Vienna (Austria), July 1974

Commission on Microchemical Techniques and Trace Analysis: General Aspects of Trace Analytical Methods I. Methods of Calibration in Trace Analysis

Commission on the Nomenclature of Organic Chemistry and IUPAC-IUB Commission on Biochemical Nomenclature: Nomenclature of Carotenoids (Rules approved 1974)

Vol. 41, No. 4: Plenary Lectures from V International Symposium on Photochemistry, Enschede (The Netherlands), July 1974

Vol. 42, Nos. 1-2: Selected Specially Invited Plenary and Symposium Lectures from III International Congress on Pesticide Chemistry including Symposium on Dispersion Dynamics of Pollutants in Environment, Helsinki (Finland), July 1974

Vol. 42, No. 3: Plenary Lectures from VII International Symposium on Carbohydrate Chemistry, Bratislava (Czechoslovakia), August 1974

*Official journal of IUPAC and additional publications of the Union are available from Pergamon Press Ltd., Headington Hill Hall, Oxford OX3 0BW, UK.

- Vol. 42, No. 4: Selected Main Lectures from International Symposium on Macromolecules, Madrid (Spain), September 1974
Working Party on Structure and Properties of Commercial Polymers: Basic Parameters, Melt Rheology, Processing and End-use Properties of Three Similar Low Density Polyethylene Samples
Working Party on Molecular Characterization of Commercial Polymers: Molecular Characterization of Polyethylene
- Vol. 43, Nos. 1-2: Specially Invited and Main Lectures from XIV Prague Microsymposium on Macromolecules and IV Discussion Conference on Macromolecules, Mariánské Lázně (Czechoslovakia), August-September 1974
- Vol. 44, No. 1: Plenary Lectures from XVI International Conference on Coordination Chemistry, Dublin (Ireland), August 1974
Commission on Electroanalytical Chemistry: Hexamethylphosphoramide—Purification and Tests for Purity
- Vol. 44, No. 2: Plenary Lectures from II Symposium on Inorganic Phosphorus Compounds, Prague (Czechoslovakia), September 1974
- Vol. 44, No. 3: Plenary Lectures from IV Polish Conference on Analytical Chemistry, Warsaw (Poland), August 1974
- Vol. 44, No. 4: Plenary Lectures from II International Symposium on Chemistry of Nonbenzenoid Aromatic Compounds, Lindau/Bodensee (Federal Republic of Germany), September 1974

Information Bulletin*

No. 49, March 1975

(Section on Medicinal Chemistry: 'Predicted' Compounds with 'Alleged' Biological Activities from Analyses of Structure-Activity Relationships Implications for Medicinal Chemists)

Nos. 50/51, November 1975

[Commission on Terminal Pesticide Residues: Terminal Residues of Cyclodiene Insecticides; Terminal Residues of Toxaphene (Camphechlor); Terminal Residues of Diazinon, Surecide, and Leptophos; Terminal Residues of Organophosphorus Insecticides; Terminal Residues of Carbamate Insecticides; Terminal Residues of Fumigants; Terminal Residues of Dithiocarbamates; Terminal Residues of Phenylamide-type Pesticides; Fate of Chlormequat in Wheat Plants; Photodecomposition of Chlorinated Pesticides]

*With effect from 1976 *Information Bulletin* is available by subscription from Pergamon Press Ltd., Headington Hill Hall, Oxford OX3 0BW, UK. Back issues of the Bulletin [up to and including Nos. 50/51 (November 1975)] are available from IUPAC Secretariat, Bank Court Chambers, 2-3 Pound Way, Cowley Centre, Oxford OX4 3YF, UK.

[Commission on Pesticide Residue Analysis: Multiresidue Methods of Analysis for Organochlorine Compounds; Residue Analysis of Organophosphorus Compounds; Residue Analysis of Organophosphorus Compounds Reported in COMECON Countries; Residue Analysis of Insecticidal Carbonates; Residue Analysis of Herbicidal Carbamates; Residue Analysis of Fumigants; Residue Analysis of Systemic Fungicides; Residue Analysis of Rethrin and Synergist; Selective Gas Chromatographic Detectors

Appendices on Provisional Nomenclature, Symbols, Units and Standards

- No. 41, January 1975: Chemical Nomenclature, and Formulation of Compositions, of Synthetic and Natural Zeolites (Commissions on Colloid and Surface Chemistry and Nomenclature of Inorganic Chemistry and International Mineralogical Association)
- No. 42, January 1975: Recommendations for Sign Conventions and Plotting of Electrochemical Data (Commission on Electroanalytical Chemistry)
- No. 43, January 1975: Recommendations for Nomenclature of Ion-Selective Electrodes (Commission on Analytical Nomenclature)
- No. 44, January 1975: Recommendations for Publication of Papers on Molecular Absorption Spectrophotometry in Solution between 200 and 800 nm (Commission on Analytical Nomenclature)
- No. 45, September 1975: List of Trivial Names and Synonyms (for substances used in analytical chemistry) (Commission on Electroanalytical Chemistry)
- No. 46, September 1975: Nomenclature of α -Amino Acids (Commission on Nomenclature of Organic Chemistry and IUPAC-IUB Commission on Biochemical Nomenclature)
- No. 47, September 1975: Nomenclature of Tocopherols and Related Compounds (IUPAC-IUB Commission on Biochemical Nomenclature)
- No. 48, September 1975: Nomenclature of Peptide Hormones (IUPAC-IUB Commission on Biochemical Nomenclature)

Miscellaneous

- ¹ International Newsletter on Chemical Education
No. 2 (June 1975)
No. 3 (December 1975)
- ² Educational Technology in the Teaching of Chemistry: Proceeding of International Symposium, Madrid (Spain), September 1975 (Editor: C.N.R. RAO)

^{1,2} Available from IUPAC Secretariat, Oxford, UK

- ³ Experimental Thermodynamics, Vol. II—Experimental Thermodynamics of Non-reacting Fluids (Monograph from Commission on Thermodynamics and Thermochemistry. Editors: B. LE NEINDRE and B. VODAR)
- ⁴ Ion Exchange Equilibrium Constants (Commission on Equilibrium Data. Compiled by Y. MARCUS and D. G. HOWERY)
- ⁵ Kinetic Parameters of Electrode Reactions of Metallic Compounds (Commission on Electrochemistry. Compiled by R. TAMAMUSHI)
- ⁶ Manual of Symbols and Terminology for Physicochemical Quantities and Units, 1973 Edition (Commission on Physicochemical Symbols, Terminology, and Units. 1973 Edn. Prepared for Publication by M. A. PAUL)
- ⁷ Proceedings of the International Conference on Colloid and Surface Science, Budapest (Hungary), September 1975. Vol. 1—Preprints of Contributed Papers
- ⁸ Oorganisk Kemisk Nomenklatur—Swedish version of Nomenclature of Inorganic Chemistry: Definitive Rules 1970 (2nd Edn., 1971)
- ⁹ Nomenclature de Chimie Inorganique: Règles de 1970—French version of Nomenclature of Inorganic Chemistry: Definitive Rules 1970 (2nd Edn., 1971)
- ¹⁰ Internationale Regeln für die chemische Nomenklatur und Terminologie
 Band 1: Regeln für die Nomenklatur der organischen Chemie
 Band 2: Regeln für die Nomenklatur der Anorganischen Chemie 1970
 German versions respectively of Nomenclature of Organic Chemistry; and Nomenclature of Inorganic Chemistry: Definitive Rules 1970 (2nd Edn., 1971)
- ¹¹ Physical Chemistry: Enriching Topics from Colloid and Surface Science (Commission on Colloid and Surface Chemistry. Editors: H. VAN OLPHEN and K. J. MYSELS)

³⁻⁶ Available from Pergamon Press Ltd., Headington Hill Hall, Oxford OX3 0BW, UK

⁷ Available from Akademiai Kiado, Budapest, Hungary

⁸ Available from Swedish Centre of Technical Terminology, Stockholm, Sweden

⁹ Available from La Société Chimique de France, 250 Rue Saint-Jacques, 75005 Paris, France

¹⁰ Available from Verlag Chemie, GmbH, D-6940 Weinheim, Federal Republic of Germany

¹¹ Available from Theorex, 8327 La Jolla Scenic Drive, La Jolla, Calif. 92037, USA

- ¹² Bibliography on High Temperature Chemistry and Physics of Materials:

Vol. 19, No. 1: January-March 1975

Vol. 19, No. 2: April-June 1975

Vol. 19, No. 3: July-September 1975

Vol. 19, No. 4: October-December 1975

- ¹³ Bulletin of Thermodynamics and Thermochemistry—No. 18, July 1975

1976

Pure and Applied Chemistry

- Vol. 45, No. 1: Commission on Physicochemical Measurements and Standards: Subcommittee on Calibration and Test Materials: Recommended Reference Materials for the Realization of Physicochemical Properties—Density

Commission on Nomenclature of Organic Chemistry: Rules for the Nomenclature of Organic Chemistry. Section E—Stereochemistry

Commission on Microchemical Techniques and Trace Analysis: Present Status of Methods for Microdetermination of Fluorine in Organic Compounds

Macromolecular Division Working Party on Structure and Properties of Commercial Polymers: Effect of Molecular Orientation on Mechanical Properties of Polystyrene

- Vol. 45, No. 2: Papers from Symposium on Reference Methods in Clinical Chemistry, held during IX International Congress on Clinical Chemistry, Toronto (Canada), July 1975

Commission on Electroanalytical Chemistry: Classification and Nomenclature of Electroanalytical Techniques

Commission on Spectrochemical and Other Optical Procedures for Analysis: Nomenclature, Symbols, Units and their Usage in Spectrochemical Analysis—II. Data Interpretation

Commission on Spectrochemical and Other Optical Procedures for Analysis: Nomenclature, Symbols, Units and their Usage in Spectrochemical Analysis—III. Analytical Flame Spectroscopy and Associated Non - Flame Procedures

¹² Available from Dr. M. G. Hocking, Department of Metallurgy, Imperial College of Science and Technology, South Kensington, London SW7 2BP, UK

¹³ Available from Publications Distribution Service, University of Michigan, 615 East University Avenue, Ann Arbor, Michigan 48106, USA

Commission on Electroanalytical Chemistry: Status of the Faraday Constant as an Analytical Standard

Commission on Electroanalytical Chemistry: Recommendations for Sign Conventions and Plotting of Electrochemical Data

Vol. 45, Nos. 3-4: Main Lectures from the Second International Congress on Industrial Waste Water and Wastes, Stockholm (Sweden), February 1975

Commission on Molecular Structure and Spectroscopy: Nomenclature and Conventions for Reporting Mössbauer Spectroscopic Data

Commission on Molecular Structure and Spectroscopy: Presentation of NMR Data for Publication in Chemical Journals—B. Conventions Relating to Spectra from Nuclei Other than Protons

Commission on Molecular Structure and Spectroscopy: Nomenclature and Spectral Presentation in Electron Spectroscopy Resulting from Excitation by Photons

Vol. 46, No. 1: Main Lectures from the Fourth Bratislava Conference on Polymers: Modified Polymers, their Preparation and Properties, Bratislava (Czechoslovakia), July 1975

Commission on Colloid and Surface Chemistry: Manual of Symbols and Terminology for Physicochemical Quantities and Units—Appendix II. Definitions, Terminology and Symbols in Colloid and Surface Chemistry. Part II: Heterogeneous Catalysis

Vol. 46, Nos. 2-4: Plenary and Sectional Lectures from the International Symposium on Macromolecules, Jerusalem (Israel), July 1975

Vol. 47, No. 1: Plenary Lectures from the 25th International Congress of Pure and Applied Chemistry, Jerusalem (Israel), July 1975

Commission on Atomic Weights: Atomic Weights of the Elements 1975

Vol. 47, Nos. 2-3: Main Lectures from the Fourth International Symposium on Carotenoids, Berne (Switzerland), August 1975

Vol. 47, No. 4: Plenary Lectures from the Fourth International Conference on Chemical Thermodynamics, Montpellier (France), August 1975

IUPAC Working Party on 'Structure and Properties of Commercial Polymers': A Collaborative Study on Tensile Properties of Rigid PVC. Long-Time Transition

Vol. 48, No. 1: Plenary Lectures from the International Symposium on Marine Natural Products, Aberdeen, Scotland (UK), September 1975

- Plenary Lectures from the XVIII Colloquium Spectroscopicum Internationale, Grenoble (France), September 1975
 Commission on Analytical Nomenclature: Recommendations for Nomenclature of Ion-Selective Electrodes
- Vol. 48, No. 2: Main Lectures from International Symposium on Plasma Chemistry, Rome (Italy), September 1975
 Round Table on Study and Applications of Transport Phenomena in Thermal Plasmas, Font Romeu (France), September 1975
 Commission on Physicochemical Measurements and Standards: Sub-Commission on Calibration and Test Materials: Recommended Reference Materials for Realization of Physicochemical Properties—Molecular Weight
- Vol. 48, No. 3: Main Lectures from International Symposium on Polymerization of Heterocycles: Ring Opening, Jablonna (Poland), June 1975
 Commission on Macromolecular Nomenclature: Nomenclature of Single-Strand Organic Polymers
- Vol. 48, No. 4: Main Lectures from International Conference on Colloid and Surface Chemistry, Budapest (Hungary), September 1975
 Commission on Biochemical Nomenclature: Nomenclature of Corrinoids
 Commission on Physicochemical Measurements and Standards: Catalogue of Reference Materials from National Laboratories (Revised 1976)

Information Bulletin

Appendices on Provisional Nomenclature, Symbols, Terminology, and Conventions

- No. 49, September 1976: Expression of Results in Quantum Chemistry (Commission on Physicochemical Symbols, Terminology and Units)
- No. 50, September 1976: Recommendations for the Presentation of Infrared Absorption Spectra in Data Collections (Commission on Molecular Structure and Spectroscopy)
- No. 51, September 1976: Symbolism and Nomenclature for Mass Spectroscopy (Commission on Molecular Structure and Spectroscopy)
- No. 52, September 1976: Reporting Experimental Data Dealing with Critical Micellization Concentrations (c.m.c.'s) (Commission on Colloid and Surface Chemistry)

- No. 53, December 1976: Nomenclature of Organic Chemistry: Section F—Natural Products and Related Compounds (Commission on Nomenclature of Organic Chemistry)
- No. 54, December 1976: Nomenclature, Symbols, Units and Their Usage in Spectrochemical Analysis—IV. X-Ray Emission Spectroscopy (Commission on Spectrochemical and Other Optical Procedures for Analysis)
- No. 55, December 1976: Recommendations for the Naming of Elements of Atomic Numbers Greater than 105 (Commission on Nomenclature of Inorganic Chemistry)
- No. 56, December 1976: Definition and Symbolism of Molecular Force Constants (Commission on Molecular Structure and Spectroscopy)
- No. 57, December 1976: Selected Definitions, Terminology, and Symbols for Rheological Properties (Commission on Colloid and Surface Chemistry)

Technical Report

- No. 14, September 1976: Recommended Methods for Ochratoxins A and B in Barley (Commission on Food Contaminants)

Comptes Rendus IUPAC Conferences

- ¹ Comptes Rendus 28th Conference, Madrid (Spain), September 1975
 - Part A: Membership Lists
 - Part B: Comptes Rendus 28th Conference

Miscellaneous

- ² International Newsletter on Chemical Education
 - No. 4: June 1976
 - No. 5: December 1976
- ³ International Thermodynamic Tables of the Fluid State—3: Carbon Dioxide
- ⁴ Atomic Masses and Fundamental Constants—5: Proceedings of the Fifth International Conference on Atomic Masses and Fundamental Constants, Paris (France), June 1975
- ⁵ Molecular Spectroscopy of Dense Phases: Proceedings of the 12th European Congress on Molecular Spectroscopy, Strasbourg (France), July 1975

^{1,3} Available from Pergamon Press Limited, Headington Hill Hall, Oxford OX3 0BW

² Available from IUPAC Secretariat, Oxford, UK

⁴ Available from Plenum Press, 227 West 17th Street, New York, N.Y. 10011, USA

⁵ Available from Elsevier Scientific Publishing Company, Amsterdam, Netherlands

- ⁶ Bibliography on High Temperature Chemistry and Physics of Materials:
Vol. 20, No. 1: January-March 1976
Vol. 20, No. 2: April-June 1976
Vol. 20, No. 3: July-September 1976
Vol. 20, No. 4: October-December 1976
- ⁷ Bulletin of Thermodynamics and Thermochemistry—No. 19, July 1976

NEW APPENDICES TO IUPAC INFORMATION BULLETIN

The following *Appendices on Provisional Nomenclature, Symbols, Terminology, and Conventions* were issued in 1976 (Nos. 49 - 52 were issued in September and Nos. 53 - 57 in December):

- No. 49 Expression of Results in Quantum Chemistry (Commission on Physicochemical Symbols, Terminology and Units)
- No. 50 Recommendations for the Presentation of Infrared Absorption Spectra in Data Collections (Commission on Molecular Structure and Spectroscopy)
- No. 51 Symbolism and Nomenclature for Mass Spectroscopy (Commission on Molecular Structure and Spectroscopy)
- No. 52 Reporting Experimental Data Dealing with Critical Micellization Concentrations (c.m.c.'s) (Commission on Colloid and Surface Chemistry)
- No. 53 Nomenclature of Organic Chemistry: Section F - Natural Products and Related Compounds (Commission on Nomenclature of Organic Chemistry)
- No. 54 Nomenclature, Symbols, Units and Their Usage in Spectrochemical Analysis—IV. X-Ray Emission Spectroscopy (Commission on Spectrochemical and Other Optical Procedures for Analysis)
- No. 55 Recommendations for the Naming of Elements of Atomic Numbers Greater than 105 (Commission on Nomenclature of Inorganic Chemistry)

⁶ Available from Dr. M. G. Hocking, Department of Metallurgy, Imperial College of Science and Technology, South Kensington, London SW7 2BP, UK

⁷ Available from Publications Distribution Service, University of Michigan, 615 East University Avenue, Ann Arbor, Michigan 48106, USA

- No. 56 Definition and Symbolism of Molecular Force Constants
(Commission on Molecular Structure and Spectroscopy)
- No. 57 Selected Definitions, Terminology, and Symbols for Rheological Properties (Commission on Colloid and Surface Chemistry)

Gratis copies may be obtained by writing to:

Mr. P. D. GUJRAL
Assistant Secretary (Publications)
IUPAC Secretariat
Bank Court Chambers
2-3 Pound Way
Cowley Centre
Oxford OX4 3YF, UK

Subscribers to the *Information Bulletin* receive all Appendices (including Technical Reports) automatically and free-of-charge on publication.

Subject to the prior agreement of IUPAC, its provisional nomenclature recommendations may be:

- (a) Republished in other journals.
- (b) Translated into other languages through the National Adhering Organizations of the Union.

The following *Technical Report* was issued in September 1976:

- No. 14 Recommended Methods for Ochratoxins A and B in Barley
(Commission on Food Contaminants)

IUPAC COLLEAGUES DECEASED

We have been informed of the death of:

<i>Denmark</i>	Prof. S. VEIBEL (15 May 1976)—Bureau (1947-1951), Commission on Nomenclature of Organic Chemistry (1949-), Commission on Analytical Reactions and Reagents (1957-1967)
<i>Federal Republic of Germany</i>	Prof. H. KAISER (23 August 1976)—Analytical Chemistry Division Committee (1965-1969, 1973-), Commission on Analytical Nomenclature (1971-1975), Commission on Spectrochemical and Other Optical Procedures for Analysis (1957-) Prof. U. STILLE (7 March 1976)—Commission on Physicochemical Symbols, Terminology, and Units (1973-)
<i>France</i>	Prof. C. DUVAL (24 February 1976)—Analytical Chemistry Division Committee (1967-1971), Commission on Analytical Reactions and Reagents (1946-1959)
<i>India</i>	Prof. N. V. SUBRA RAO (5 April 1976)—Committee on Teaching of Chemistry (1970-)
<i>Spain</i>	Prof. F. LUCENA CONDE (30 September 1976)—Commission on Analytical Reactions and Reagents (1973-) Prof. A. RIUS-MIRÓ (3 July 1973)—Commission on Electrochemistry (1959-)
<i>Switzerland</i>	Prof. H. SCHMID (19 December 1976)—Swiss Delegation to 26th, 27th, and 28th IUPAC Council Meetings (1971, 1973, 1975)
<i>Hungary</i>	Prof. T. ERDEY-GRÚZ (16 August 1976)—Commission on Electrochemistry (1959-), Commission on Nomenclature of Inorganic Chemistry (1969-)
<i>UK</i>	Sir DAVID MARTIN (16 December 1976)—Committee on Statutes and Bylaws (1971-1975)
<i>USA</i>	Dr. R. L. KENYON (30 March 1976)—Committee on Publications (1969-)
<i>USSR</i>	Prof. A. N. FRUMKIN (31 May 1976)—Commission on Electrochemistry (1957-1971), Physical Chemistry Division Committee (1965-1969)

CALENDAR OF IUPAC-SPONSORED MEETINGS

1977

May 21 - 27	VI International Symposium on Magnetic Resonance (Dr. R. W. DOLAN, Executive Secretary, VI International Symposium on Magnetic Resonance, National Research Council of Canada, Ottawa K1A 0R6, Canada)	Banff, Alberta (Canada)
May 22 - 27	International Symposium on Microchemical Techniques 1977 (Dr. H. FREY, Secretary, c/o ISM Secretariat, CH-8606 Greifensee-Zürich, Switzerland)	Davos (Switzerland)
June 27 - July 9	International Symposium on Materials for High Temperature Energy Sources (Dr. J. P. COUTURES, Secretary of Organizing Committee, Laboratoire des Ultra-Réfractaires du Centre National de la Recherche Scientifique, BP 5, Odeillo, F-66120 Font Romeu (France))	Odeillo (France)
July 17 - 22	V International Conference on Crystal Growth (Dr. K. NASSAU, Secretary ICCG-5, Bell Laboratories, Room 6D-205, Murray Hill, New Jersey 07974, USA)	Boston, Massachusetts (USA)
July 17 - 22	IV Society for Analytical Chemistry Conference (Miss P. E. HUTCHINSON, Secretary of Analytical Division, Chemical Society, Burlington House, Piccadilly, London W1V 0BN, UK)	Birmingham (UK)
July 17 - 22	International Symposium on Macromolecules (Mr. P. M. O'REILLY, Symposium Officer MACRO DUBLIN 1977, Institute for Industrial Research and Standards, Ballymun Road, Dublin 9, Ireland)	Dublin (Ireland)
July 18 - 23	XVIII International Conference on Coordination Chemistry (Prof. P. SENISE, Chairman, XVIII ICC, Instituto de Química, Universidade de São Paulo, Caixa Postal 20780, São Paulo, Brazil)	São Paulo (Brazil)
July 25 - 29	VI AIRAPT International Conference on High Pressure (Prof. K. D. TIMMERHAUS, Chairman of Planning Committee, VI AIRAPT International Conference on High Pressure, Engineering Center AD 1-25, University of Colorado, Boulder, Colorado 80309, USA)	Boulder, Colorado (USA)
August 15 - 18	XVII Microsymposium on Macromolecules - Medical Polymers: Chemical Problems (Dr. P. ČEPELÍN, Scientific Secretary, PMM Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-162 06 Praha 616, Czechoslovakia).	Prague (Czechoslovakia)

August 23 - 26	V International Conference on Chemical Thermodynamics (Prof. S. SUNNER, Thermochemistry Laboratory, Chemical Center, University of Lund, POB 740, S-220 07 Lund, Sweden)	Ronneby (Sweden)
August 25 - 30	International Conference on Chemical Education in the Coming Decades: Problems and Challenges (Conference Secretariat, Department of Chemistry, University of Ljubljana - RCPU, POB 18/1, YU-61001 Ljubljana, Yugoslavia)	Ljubljana (Yugoslavia)
August 28 - September 2	International Mass Spectrometry Symposium on Natural Products (Dr. Z. V. I. ZARETSKII, Isotope Laboratory, Weizmann Institute of Science, Rehovot, Israel)	Rehovot (Israel)
August 30 - September 2	IUPAC-IUPHAR Symposium on Biological Activity and Chemical Structure (Secretariat IUPAC-IUPHAR Symposium, c/o Merck Sharp & Dohme BV, Professional and Government Liaison, Waarderweg 39, POB 581, Haarlem, Netherlands)	Noordwijkerhout (Netherlands)
September 4 - 10	26th IUPAC Congress (26th IUPAC Congress, POB 56, Kanda Post Office, Tokyo 101-91, Japan)	Tokyo (Japan)
September 5 - 9	V International Conference on Vacuum Ultraviolet Radiation Physics (Dr. M. POUHEY, Executive Secretary, 1 Place A. Briand, F-92190 Meudon, France)	Montpellier (France)
September 12 - 16	VIII International Conference on Organometallic Chemistry (Prof. Y. ISHII, Chairman of VIII ICOMC, Faculty of Engineering, Nagoya University, Chikusa, Nagoya 464, Japan)	Kyoto (Japan)
September 12 - 16	VII International Vacuum Congress and III International Conference on Solid Surfaces (Dr. R. DOBROZEMSKY, Secretary General, 7th IVC & 3rd ICSS, Postfach 300, A-1082 Wien, Austria)	Vienna (Austria)

1978

March 8 - 9	International Symposium on Harmonisation of Collaborative Analytical Studies (Dr. H. EGAN, Laboratory of the Government Chemist, Cornwall House, Stamford Street, London SE1 9NQ, UK)	To be decided
April 10 - 14	IX International Symposium on Carbohydrate Chemistry (Prof. W. G. OVEREND, Chairman of Organizing Committee, Department of Chemistry, Birkbeck College, Malet Street, London WC1E 7HX, UK)	London (UK)
June 5 - 9	III International Symposium on Genetics of Industrial Microorganisms (Prof. D. PERLMAN, Chairman of Organizing Committee, School of Pharmacy, University of Wisconsin, Madison, Wisconsin 53706, USA)	Madison, Wisconsin (USA)
July 10 - 13	World Conference on Future Sources of Organic Raw Materials (Chemical Institute of Canada, 906-151 Slater Street, Ottawa, Ontario, Canada K1P 5H3)	Toronto (Canada)

July 24 - 28	IV International Congress of Pesticide Chemistry (Dr. M. SPINDLER, Secretary, Scientific Programme Committee of Symposium, POB 182, CH-4013 Basle, Switzerland)	Zürich (Switzerland)
July 24 - 29	V International Symposium on Carotenoids (Dr. J. W. PORTER, Chairman of Organizing Committee, Department of Physiological Chemistry, University of Wisconsin Medical Center, 1215 Linden Drive, 589 Medical Sciences Building, Madison, Wisconsin 53706, USA)	Madison, Wisconsin (USA)
September 4 - 7	VI International Symposium on Medicinal Chemistry (Trans World Conference Organisers Ltd., 31 Plane Tree Way, Woodstock, Oxford OX7 1PE, UK)	Brighton (UK)
September 4 - 8	IV IUPAC Conference on Physical Organic Chemistry (Dr. J. F. GIBSON, Conference Secretary, Chemical Society, Burlington House, Piccadilly, London W1V 0BN, UK)	York (UK)
September 11 - 15	II IUPAC Conference on Organic Synthesis (Prof. S. SAREL, Chairman of Conference Organizing Committee, Department of Pharmaceutical Chemistry, Hebrew University School of Pharmacy, POB 12013, Jerusalem, Israel)	Jerusalem and Haifa (Israel)
September 17 - 23	XI International Symposium on Chemistry of Natural Products (Dr. R. VLAHOV, Chairman of Symposium Committee, Institute of Organic Chemistry, Bulgarian Academy of Sciences, Sofia 1113, Bulgaria)	Varna (Bulgaria)
October	International Symposium on Macromolecular Chemistry (Prof. K. A. ANDRIANOV, Symposium Organizing Committee, Polymer Scientific Council, Academy of Sciences of USSR, Vavilov Street 32, 117312 Moscow, USSR)	Tashkent (USSR)

1979

August 27 - 31	27th IUPAC Congress (Dr. J. LARINKARI, Kemian Keskusliitto, POB 13028, Fabianinkatu 7B, SF-00131 Helsinki 13, Finland)	Helsinki (Finland)
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CALENDAR OF NON-IUPAC MEETINGS

1977

May 31 - June 2	International Conference on Lasers in Chemistry (Dr. M. WEST, The Royal Institution, 21 Albermarle Street, London W1X 4BS, UK)	London (UK)
August 10 - 19	XV International Congress of the History of Science (Dr. E. G. FORBES, Roayl Society of Edinburgh, 22 George Street, Edinburgh EH2 2PQ, Scotland, UK)	Edinburgh (UK)
August 22 - 25	CHEM ED 77: An ACS—CIC sponsored International Conference on Chemical Education (Dr. R. FRIESEN, Chem Ed 77, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1)	Waterloo (Canada)
September 4 - 9	4th International Congress on Photosynthesis (Dr. J. COOMBS, Tate and Lyle Ltd., POB 68, Reading RG6 2BX, UK) K)	Reading (UK)
September 28 - 30	III International Symposium on Nutrition and Work (Prof. G. DERBY, Département de Nutrition et des Maladies Métaboliques de l'Université de Nancy, 40 rue Lionnois, 54000 Nancy, France)	Nancy (France)
October 17 - 22	I International Congress on Phosphorus Compounds (Mr. KABBAJ, Director of Technical Research, World Phosphate Rock Institute, 8 rue de Pentièvre, 75008 Paris, France)	Rabat (Morocco)
October 23 - 26	27th Canadian Chemical Engineering Conference (Dr. J. HIGGINS, Registration Chairman 27th Conference, 304 Examiner Building, 805—5th Street S.W., Calgary, Alberta, Canada T2P 1W3)	Calgary (Canada)
November 28 -December 2	Protons and Ions involved in Fast Dynamic Phenomena—30th International Meeting of Société de Chimie physique (Dr. C. TROYANOWSKY, General Secretary 30th Meeting, 10 rue Vauquelin, 75231 Paris Cedex 05, France)	Paris (France)

1978

February 26 —March 3	X International Congress of Clinical Chemistry (Dr. A. L. PULIDO, X International Congress of Clinical Chemistry, P.O. Box 24 - 498, Mexico 7 D F)	Mexico City (Mexico)
August 20 - 25	EUROANALYSIS III—Third European (FECS) Conference on Analytical Chemistry (Conference Officer, EUROANALYSIS III, Institute for Industrial Research and Standards, Ballymun Road, Dublin 9, Ireland)	Dublin (Ireland)
August 28 - 30	2nd International Symposium on Inorganic Ring Systems (Dr. W. FRITSCH, Gesellschaft Deutscher Chemiker, POB 90 04 40, D-6000 Frankfurt/Main 90, Federal Republic of Germany)	Göttingen (FRG)

LIST OF ABBREVIATIONS

ACS	American Chemical Society
AOAC	Association of Official Analytical Chemists
CAS	Chemical Abstracts Service
CEBJ	Commission on Editors of Biochemical Journals of IUB
CEE	Communauté Européenne Economique
CODATA	ICSU Committee on Data for Science and Technology
COMECON	Council of Mutual Economic Assistance of Communist Nations
EFMC	European Federation for Medicinal Chemistry
FAO	UN Food and Agriculture Organization
FIP	Fédération Internationale Pharmaceutique
IAEA	International Atomic Energy Agency
ICSU	International Council of Scientific Unions
ICSU AB	ICSU Abstracting Board
ICTA	International Confederation for Thermal Analysis
ISO	International Organization for Standardization
ISO/TC	ISO Technical Committee
IFCC	International Federation of Clinical Chemistry
IOCG	International Organization for Crystal Growth
IUB	International Union of Biochemistry
IUBS	International Union of Biological Sciences
IUCr	International Union of Crystallography
IUFoST	International Union of Food Science and Technology
IUNS	International Union of Nutritional Sciences
IUPHAR	International Union of Pharmacology
IUPAP	International Union of Pure and Applied Physics
OECD	Organization for Economic Cooperation and Development
SCOPE	ICSU Scientific Committee on Problems of the Environment
UN	United Nations
UNESCO	UN Educational, Scientific, and Cultural Organization
UNISIST	UNESCO-ICSU Programme on International Science Information System
WHO	UN World Health Organization

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**INTERNATIONAL UNION OF PURE
AND APPLIED CHEMISTRY**

**INFORMATION BULLETIN
NUMBER 54**

DECEMBER 1977

PERGAMON PRESS

INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

President	— Prof. G. SMETS (Belgium)
Vice-President	— Prof. H. ZOLLINGER (Switzerland)
Secretary General	— Prof. G. OURISSON (France)
Treasurer	— Prof. O. HORN (Federal Republic of Germany)

IUPAC Secretariat — Bank Court Chambers
2/3 Pound Way, Cowley Centre
Oxford OX4 3YF, UK
Telephone — Oxford 770125 & 772834
Telegrams — IUPAC OXFORD

The International Union of Pure and Applied Chemistry (IUPAC), formed in 1919, is a voluntary, nongovernmental, nonprofit association of organizations, each of which represents the chemists of a member country.

Its objectives are:

to promote continuing cooperation among the chemists of the member countries;
to study topics of international importance to pure and applied chemistry which need regulation, standardization, or codification;
to cooperate with other international organizations which deal with topics of a chemical nature;
to contribute to the advancement of pure and applied chemistry in all its aspects.

The membership of IUPAC presently comprises 41 countries, each represented by a national organization, such as an academy of science or research council.

IUPAC INFORMATION BULLETIN

The Bulletin provides a news medium for the various activities of IUPAC, especially of its 50 or so committees. It carries advance information on forthcoming symposia which are to be sponsored by IUPAC together with reports of such meetings which have recently taken place. Coverage is also given to projects in which IUPAC is collaborating with other international organizations.

Two series of Appendixes to the Bulletin are issued:

- (i) Appendixes on Provisional Nomenclature, Symbols, Terminology, and Conventions
- (ii) Technical Reports

In 1977 only one issue of the Bulletin will be published, viz. No. 54: the annual subscription will be US \$12.00 (£6.00) inclusive of the two series of Appendixes and postal charges (surface). The contents, frequency, and subscription rate for the Bulletin in 1978 are under review, and details will be announced shortly.

Subscription orders may be placed direct, or through an agent, with IUPAC's official publisher Pergamon Press Ltd., Headington Hill Hall, Oxford OX3 0BW, UK, or with its overseas offices/agencies.

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Prof. G. Smets (Belgium)

1977-79

29th IUPAC GENERAL ASSEMBLY

Warsaw, 10–21 August 1977

At the conclusion of the above General Assembly, the Presidency of the Union was assumed by Prof. G. SMETS (Belgium).

Curriculum Vitae of New President

GEORGES JOSEPH GUILLAUME ROBERT SMETS was born in Leuven on 11 August 1915. His advanced chemical education was at the Université de Louvain, where he obtained his Ph.D. (1940) with a thesis on 'Isomérisation des alcools α -éthyléniques' under the direction of Prof. P. BRUYLANTS. In 1940 he received the J. S. Stas Award of the Académie Royale de Belgique and the following year became a research associate (aspirant) of the National Research Council. The first half of 1942 was spent as a research fellow under the guidance of Prof. L. DENIVELLE at the Conservatoire National des Arts et Métiers in Paris, then followed a period of two years in industry as a member of the Chemical Research Division of Gavaert NV. Photoproducten in Antwerp. In 1944 Prof. SMETS returned to the academic world as an Associate Professor at the Katholieke Universiteit Leuven (KUL)—Université Catholique de Louvain (UCL). He became a full Professor in 1948, and was subsequently a member of the Bureau (1966–1977) and Dean (1970–1973) of the Faculty of Sciences and a member of the University Academic Council (1970–1973).

Prof. SMETS has made essential contributions to macromolecular chemistry. He was one of the first to point out, in 1951 at the ACS meeting in New York, the possibility of changing the properties of macromolecules by graft copolymerization. His work on block- and graft- copolymers is extensive and fundamental. Prof. SMETS' background in organic chemistry was responsible for his interest in new monomers, their synthesis, and the kinetics of polymerization. He has also studied the reactions of polymers, both intermolecular and intramolecular, and the relationship between microtacticity and reactivity. His current interests are the application of new organic reactions to polymers, cycloaddition, photoaddition, photochromic polymers, reactions in the solid state, photochemical processes, anionic polymerization, and physical properties of high polymers in relation to their

chemical structure. Prof. SMETS is the founder of the research centre for polymer research at KUL-UCL (they became independent universities in 1970), and his school has received international recognition. He is the author of some 225 scientific papers, most of which have been published in international journals.

Prof. SMETS has been an exchange and visiting Professor in France (1959, 1961), Japan (1972), Poland (1967), UK (1958), USA (1974), USSR (1964). He has also been an invited lecturer by scientific societies in several countries and a main lecturer at most of the IUPAC International Symposia on Macromolecular Chemistry during the past two decades. In addition he has been Chairman or Honorary Chairman of four international symposia on various aspects of polymer chemistry held in Belgium, cofounder and editor of the *Journal of Polymer Science* (USA), and member of the editorial board of *Makromolekulare Chemie* (FRG).

His awards and honours include: Advanced Fellow of the Belgian American Educational Foundation (1949); Agathon de Potter Award of the Royal Academy of Belgium (1952); holder of the Belgian Francqui Chair at the Faculty of Applied Sciences of the Université de Liège (1952–53); Corresponding Member of the Koninklijke Academie voor Wetenschappen, Letteren en Schone Kunsten van België (1953–), Member (1955), and President (1962); Honorary Member of the Société de Chimie Industrielle de Paris (1954); Fellow of the New York Academy of Sciences (1962); Polymer Chemistry Award of the American Chemical Society (1971); Decennial Award for Chemistry of the Belgian Government (1960–1970); Doctor *honoris causa* of Aberdeen University (1973); Centennial Fellow of the American Chemical Society (1976).

In Belgium Prof. SMETS has served as a Member of the National Committee of Chemistry (since 1958), Chairman of the Committee of Experts and Member of the Bureau of the National Council for Scientific Programming (1959–1966), Member of the Bureau and of the Board of Directors of the Institute for Scientific Research in Industry and Agriculture (IRSIA: 1961–1967), Member of the Commission on Inorganic and Organic Chemistry of the National Foundation for Scientific Research (1972–), and Chairman of the High Polymer Research Group (1973–1977).

Prof. SMETS has been involved continuously in IUPAC activities since 1947, initially as a Titular Member or Belgian National Representative of the Commission on Macromolecules within the Division of Physical Chemistry. During 1967–1975 he was Secretary of the newly

created Macromolecular Division and a Titular Member (1968–1975) of its Nomenclature Commission. He was elected a Member of the Bureau of IUPAC in 1969 and reelected in 1973. In 1975 he was elected a Member of the Executive Committee and he became Vice-President of the Union at Madrid in 1975.

Other Officers

As a result of the election held at the Council meeting on 21 August, the new Vice-President (President-Elect 1979) of the Union is:

Prof. H. ZOLLINGER (Switzerland)

The other two Officers of the Union were elected in 1975 and continue until 1979:

Secretary General—Prof. G. OURISSON (France)

Treasurer —Prof. O. HORN (FRG)

Bureau

During the interval between the biennial meetings of the Council, the Bureau is responsible for ensuring an orderly discharge of functions of the Union.

In addition to the four Officers of the Union, the following are now automatically Members of the Bureau:

Past-President (1977–1979) — Dr. R. W. CAIRNS (USA)

Division and Section Presidents:

Prof. S. SUNNER (Physical Chemistry Division: 1977–1979)

Prof. N. N. GREENWOOD (Inorganic Chemistry Division:
1977–1981)

Prof. P. YATES (Organic Chemistry Division: 1977–1979)

Prof. V. A. KABANOV (Macromolecular Division: 1977–1981)

Prof. T. S. WEST (Analytical Chemistry Division: 1977–1981)

Prof. H. SUOMALAINEN (Applied Chemistry Division:
1977–1981)

Dr. M. ROTH (Clinical Chemistry Section: 1977–1979)

The 12 Elected Members of the Bureau are now:

Prof. A. ABOU-EL-AZM (Arab Republic of Egypt: 1975–1979)

Dr. J. W. BARRETT (UK: 1977–1981)

*Prof. Sir DEREK BARTON (1973–1981)

**Prof. A. R. H. COLE (Australia: 1973–1981)

*Reelected at Warsaw for a further period of 4 years after nomination by Bureau.

**Reelected at Warsaw for a further period of 4 years.

Prof. N. M. EMANUEL (USSR: 1971-1979)
Dr. O. ISLER (Switzerland: 1971-1979)
Prof. A. KJAER (Denmark: 1977-1981)
Prof. J. MICHALSKI (Poland: 1977-1981)
Prof. S. NAGAKURA (Japan: 1975-1979)
Prof. C. G. OVERBERGER (USA: 1977-1981)
Prof. A. PEREZ-MASIÁ (Spain: 1975-1979)
Prof. C. N. R. RAO (India: 1977-1981)

New National Adhering and Associated Organizations

Council approved an application for membership of IUPAC from the Supreme Council of Sciences of the Syrian Arab Republic, but noted that Sociedad Química de México had ceased its membership at the end of 1976 because of nonpayment of outstanding annual subscriptions.

In order to meet the inflationary costs of the Union since 1974, a 15% increase in the present minimum category subscriptions for member countries was agreed for 1978 onwards.

The International Association for Cereal Chemistry and the International Commission on Application of the Mössbauer Effect were judged to be international organizations whose aims and activities are in harmony with those of IUPAC, and they were admitted to Associated Organization status of the Union.

Publications

The change in official publisher had resulted already for 1976 in a 10% increase in income from royalties over the minimum guaranteed by Pergamon Press. Momentum is now mounting on the much needed reorganization of the actual publications of the Union. From the start of 1978 plenary lectures from IUPAC-sponsored symposia will be published in the journal *Pure and Applied Chemistry* as soon as they become available individually in camera-ready form, rather than as a complete set of lectures in a single issue for each particular symposium. A new IUPAC news journal is contemplated for 1979 onwards, by consolidation of the existing *Information Bulletin* and its Appendices plus the *Comptes Rendus* of the biennial General Assemblies, but with improved format.

Chemistry and Industry

The informal scheme for greater collaboration between IUPAC Company Associates developed at the 27th Conference in Munich (1973) had been operating for four years with modest success. In order to improve further the exchange of information between industry and the Union, Council approved the creation of a Standing Committee on Chemistry and Industry:

1. To guide and inform Company Associates on IUPAC programmes and policies.
2. To establish important areas of chemical science in IUPAC related to ongoing industrial needs.
3. To put to industry enquiries on major chemical matters.

1979 IUPAC General Assembly

Council accepted the recommendation of Schweizerisches Komitee für Chemie that the 30th General Assembly of the Union should be held in Davos (2–10 September 1979). It will be immediately preceded by the 27th IUPAC Congress in Helsinki (For details see pp. 114–115). Also it was decided to hold the 31st General Assembly in Belgium (Leuven, 1981) and the 28th Congress in Canada (Vancouver, 1981).

Comptes Rendus 29th General Assembly

It is envisaged that Part A of the *Comptes Rendus 29th General Assembly* (details to be announced later) will contain the new membership of all IUPAC bodies, but the deliberations of Council and the 50 or so Standing Committees, Division and Section Committees, Commissions and Subcommittees may be published in the *IUPAC Information Bulletin* during 1978 rather than appear as Part B of the *Comptes Rendus*.

CHEMRAWN—CHEMICAL RESEARCH APPLIED TO WORLD NEEDS

The US National Committee for IUPAC included on the Agenda for the IUPAC Council meetings in Munich (August 1973) an item entitled 'Opportunities for International Cooperation through IUPAC'. At the subsequent meetings of Council in Madrid (September, 1975) the US National Committee defined in a more specific way its ideas and suggestions under the general heading of 'Chemical Research Applied to World Needs' (CHEMRAWN). The statement given at Madrid is reproduced here in full as background to the more recent article published in *Information Bulletin* Nos. 52/53 (May 1977), pp. 15-17.

In order to clarify our own thinking and to convey to the IUPAC Executive Committee the basic elements of our proposal, we have reduced our deliberations to the series of concise statements of purpose and proposed activities shown below. In so doing, we clearly recognize that in many ways we are simply calling for a continuation or re-emphasis of those activities and functions which IUPAC has successfully performed over a period of many years. It is natural that we arrive at this point for two basic reasons: (i) our desire to develop a proposal in a framework which is familiar to the current mechanisms of IUPAC; and (ii) the difficulties of improving upon an already excellent organization that has been developed, tested, perfected, and proven through years of service to the international scientific community.

Purpose

- (i) To identify human needs amenable to solution through chemistry with particular attention to those areas of global or multinational interest.
- (ii) To serve as an international body and forum for the gathering, discussion, advancement, and disseminating of chemical knowledge deemed useful for the improvement of man and his environment.
- (iii) To serve as an international, nongovernmental source of advice for the benefit of governments and international agencies with respect to chemistry and its application to human needs.

To achieve these ends, it is proposed that CHEMRAWN activities include the following:

- (a) Provide scientific and organizational leadership for the purpose of identifying chemical-related needs, opportunities, and priorities on an international and worldwide scale.
- (b) In cooperation with established scientific bodies, organize international conferences, forums, workshops, symposia, collaborative studies, etc. for the gathering, presentation, discussion, evaluation, publication, and dissemination of information relating to chemistry, man, his needs and environment.
- (c) Help provide an understanding of trends, consequences, alternatives, and resources relating to raw materials and chemical intermediate supply.
- (d) Act as a focal point, clearing house, and coordinating body for international conferences relating to chemical research and world needs.
- (e) As a part of ICSU, serve as an advisory body to the United Nations, its member nations and agencies with special attention to developing nations.
- (f) Develop means to assist public understanding of chemistry and its relationship to world economy and the betterment of man.

How can we accomplish the above stated objectives, namely, to broaden the scope of symposia-type activities to include chemical research applied to world needs, to provide a focal point for clearing-house and coordination functions in connection with interdisciplinary conferences relating to chemical research and world needs, and to provide an internal mechanism with IUPAC for the generation of definitive resource reports and data bases essential to solution of many of the world's chemical problems? We propose the establishment of a new group (an *ad hoc* commission or task force) derived from all disciplines represented by the current six divisions of IUPAC. Obviously, the chairman of such a group will be an important key in the success of the plan. This group will report directly to the Bureau and consideration should be given to appointing the chairman, at least on a temporary basis, as a member of the Bureau. In our judgment the establishment and initial activity of such a group could be easily structured within the existing constraints of IUPAC. We recognize that there are certain financial restraints on IUPAC at the present time, nevertheless, we feel the proposed programme should be of very high

priority and perhaps even replace certain existing programmes of lower priority. We would hope that this group might even eventually become self-supporting if its products proved useful and provide an incentive for greater industrial participation in IUPAC.

An important task of this new group would be to develop a priority list of world problems involving chemistry or of concern to chemically based industries, taking into consideration not only the importance of the substance of the problem but also the feasibility of completion of the project. After this important initial task, the group would then prepare or commission the preparation of a report or a data base or a resource projection on a specific major topic.

Based on the above considerations a number of topics can be identified in a preliminary way. The following list is designed to illustrate possible scope and content. Since the resources of IUPAC are limited, it is obvious that priorities will have to be set and one or two entry points established.

Natural Resources, Raw Materials, Energy, and Chemical Intermediate Supply

1. *Computerized Resource Inventories*
2. *Future Material Requirements*
 - Trends
 - Consequences
 - Alternatives
3. *Resource Exploration, Discovery, and Development*
 - Coal-based chemical intermediates
 - Oil shale, tar sands, etc.
 - Solutes from sea water
 - Forest products and other renewable sources
 - Solar and nuclear energy
4. *Resource Conservation*
 - Waste elimination
 - Waste utilization
 - Recyclization
 - Preservation of petroleum reserves for chemical use

Chemistry in Agriculture: Chemistry's Role in World Food Supply

1. *Identification and Mitigation of Crop Yield-Inhibitors*
 - Fungi (fungicides)
 - Bacterial diseases of plants (bactericides)
 - Insects (insecticides)
 - Weeds (herbicides)
 - Nematodes (nematocides)
2. *Crop Yield-Promoters*
 - Fertilizers
 - Essential elements in soils
3. *Livestock Growth-Promoters*
 - Growth-promoting hormones
 - Diet supplements
 - Pituitary stimulants
4. *Linking of Yield Inhibitors with Crops and with Growing Areas*
 - Where are problems most severe and with what crops?
 - Which crops, with what problems, are
 - most efficient in land use?
 - most valuable as essential foods for marginal diets?
5. *Elimination or Reduction of Crop Drains*
 - Rodents (rodenticides)
 - Spoilage (bactericides/fungicides/insecticides)
6. *Livestock Growth-Inhibitors*
 - Helminths (anthelmintics)
 - Ectoparasites (ectoparasitocides)
 - Bacterial diseases of poultry (coccidiostats, histomonostats)

Chemistry in the Quality of Life

1. *Chemical Processes for Water Purification*
2. *Chemical Modification of the Properties of Fibres, Fabrics, and Paper*
3. *Chemistry in Photography and Art*
4. *Chemistry in Construction Materials*
5. *Chemistry in Transportation Vehicles*

6. *Chemistry in the Manufacture of Food Products*
7. *Human and Animal Pharmaceuticals*
8. *Monitoring and Maintaining Quality of the Environment*
9. *Chemistry in the Preservation of Objects and Materials*
(Coatings, Corrosion Inhibitors, Rust Inhibitors, etc.)
10. *Chemistry in Communication and Electronics*
11. *Chemistry in Education and Manpower Development*

Health Protection in the Chemical Industry

1. *Acute Insults to Health*
 - Identification of acute toxicants
 - Identification of respiratory irritants
 - Identification of eye and skin irritants and vesicants
 - Establishment of safe levels of exposure
 - Analytical monitors in the working areas
 - Detection and control of levels in factory effluents
 - Selection and development of non-toxic substitutes
2. *Chronic Insults to Health (Industrial Mutagens and Carcinogens)*
 - Identification and definition of hazard
 - Establishment of safe levels of exposure
 - Analytical monitors in the working areas
 - Detection and control of levels in factory effluents
 - Selection and development of non-toxic substitutes
3. *Chemistry of Industrial Atmospheres*
 - In the chemical workplace
 - In the industrial community
 - Interactions and synergisms

REPORTS OF IUPAC BODIES

OPEN MEETING OF ANALYTICAL CHEMISTRY DIVISION

Madrid, 6 September 1975

1. President's Opening Remarks

The Division President, Prof. N. TANAKA, welcomed all those present. He asked the meeting to stand for a moment in memory of Dr. A. C. MENZIES and Prof. C. L. WILSON. The President thanked the members of the Division for their efforts over the past two years which had enabled him to report considerable progress in his biennial review to the Bureau and Council.

2. Elections to Division Committee

The President formally announced the results of the elections to fill the vacancies occurring in the Division Committee

Prof. G. DUYCKAERTS (Belgium)	Prof. E. PUNGOR (Hungary)
Prof. H. FREISER (USA)	Prof. S. B. SAVVIN (USSR)
Prof. F. PELLERIN (France)	Dr. J. C. WHITE (USA) — Division Secretary

The President welcomed these new Members of the Committee and thanked the retiring Members for their work during the past four years.

3. Summary of Division Committee Business

The Secretary summarized the business being considered by the Division Committee during the Conference, in particular the revised IUPAC Statutes and Bylaws; collaboration with Applied Chemistry Division, ISO, Interdivisional Committee on Nomenclature and Symbols; publication of reports and the format of nomenclature documents; and the policy guidelines for the Division's programme. The President invited comments from those present.

Prof. R. BELCHER said that, as a result of what was said at the Open Meeting in Munich, he had sent copies of his proposals to the Committee on Statutes and Bylaws together with an explanatory letter to all Members of the Division Committee. He had no acknowledgements of receipt of these documents and, as he believed that they had not been discussed by the Committee, required to know why no action had been taken. The Secretary said that he had omitted to remind the Division Committee to comment on the documents and had not included them in the papers for the Division Executive Committee meeting in 1974 so that he must be considered responsible for the lack of action by the Committee. Prof. BELCHER expressed his dissatisfaction at this state of affairs.

Prof. P. ZUMAN initiated a discussion on the publications policy of IUPAC and the forms of publication available, as outlined earlier. The point was again made as to whether enough chemists saw IUPAC publications. The Secretary outlined a proposal by the Publications Committee which would have resulted in particular pieces of Commission work being made known to a wide readership but which was rejected by the relevant Commission. He had already been asked by the Division Committee to get an updated statement of publications policy. Prof. H. KAISER asked whether there was any mechanism for periodic revision of IUPAC nomenclature documents. None was known but the work on the 'Compendium of Analytical Nomenclature' should deal with this aspect for our own Division. Prof. H. M. N. H. IRVING asked whether there was a list of IUPAC publications from all the Divisions and if not whether one could be provided. The Secretary said that the *Information Bulletin* listed Provisional Nomenclature Appendices and Technical Reports but that, so far as he knew, reports in *Pure and Applied Chemistry* were not listed; he suggested that it would be far too costly to distribute individual lists to Division Members but that the Secretariat would probably provide copies of relevant pages of the *Information Bulletin* on request and might be able to list reports appearing in *Pure and Applied Chemistry* in future editions of the Bulletin. (*Editorial Note: Titles of definitive as well as provisional nomenclature recommendations, as also those of other publications of the Union issued during a year are listed in the following year in an issue of Information Bulletin.*)

In reply to an enquiry by the President, Prof. IRVING said that the reorganization of the Interdivisional Committee on Nomenclature and Symbols (IDCNS) was still not settled but the IUPAC President was anxious to get it finalized at this Conference. It seemed possible that

membership of IDCNS would be independent of Division membership, with nominees from the Bureau and Commissions, editors of journals and other coopted members. Prof. BELCHER confirmed the earlier difficulties of the Committee. Profs. R. G. BATES and P. ZUMAN expressed their disagreement with the Division Committee's list of priorities especially since it appeared to play down the involvement of the Division in environmental problems. Prof. BELCHER said that his Commission was reconstituted specifically for standardization of methods of analysis and that the order of priority must depend on the main theme of each Commission's work. Prof. KAISER said that the list reflected the possibilities of satisfactory completion of projects within the limitations of finance and time under which members of the Division had to work. Prof. H. W. NÜRNBERG disagreed—it was quite possible for the members to collaborate to provide sound analytical methods.

The President asked for comments on the proposal for the formation of a Division of Health and Environmental Chemistry formed largely from the Applied Chemistry Division. There was no direct comment on this point but there was general agreement that Analytical Chemistry Division could and should be involved in environmental problems. Prof. H. FREISER said that there was a proliferation of methods, the validity of which was often open to doubt. Cooperation with Division VI might bring new problems into the Division which could help to get standardization of methods of environmental analysis. He had the impression, and Prof. HUME agreed, that instrument manufacturers were exerting pressures on non-scientific governmental bodies to promulgate 'standards' without reference to scientists. Prof. G. H. NANCOLLAS agreed that it was essential that Analytical Chemistry Division should be involved.

4. Concluding Remarks

The President recorded the appreciation of the Division for Prof. KEMULA's long service on the Division Committee. Prof. KEMULA thanked all those with whom he had worked in IUPAC for their help and friendship. The president then thanked members of Division Committee and Commissions who had completed their terms of office and finally Mr. R. W. FENNELL for his eight years' work as Division Secretary.

R. W. FENNELL

MACROMOLECULAR DIVISION WORKING PARTY ON SUPPORTED POLYMER FILMS (WSPSF)

Stuttgart, 11-12 March 1976

Present: Mr. P. H. FINK-JENSEN (Chairman), Dr. U. ZORLL (Secretary), Mr. G. CHRISTENSEN, Prof. W. FUNKE, Prof. K. HAMANN, Dr. K. M. OESTERLE, Mr. H. K. RAASCHOU NIELSEN, Dr. H. SPOOR, Mr. A. R. H. TAWN, Dr. J. A. W. van LAAR, Dr. D. WAPLER, Mr. V. ZVONAŘ. Prof. H. BENOÎT (Macromolecular Division Committee) attended by invitation.

1. Minutes of Previous Meeting

The minutes of the meeting held in Brussels on 28-29 November 1974 had been published in *Information Bulletin* Nos. 50/51 (November 1975), pp. 112-114.

2. Report of Chairman

Mr. FINK-JENSEN explained the present status of the Working Party which was now part of the Commission on Polymer Characterization and Properties with Dr. J. W. BARRETT as the Commission's Chairman. It was noted that since no funds of a substantial nature would be allocated by IUPAC to the Working Party most of the work would need to be carried out from the resources of the institutes/industry to which the members belong.

3. Reports on Current Activities

Analytical Group

Mr. FINK-JENSEN mentioned that the paper on analysis of polyamides had been finalized by Dr. O'NEILL and Mr. CHRISTENSEN and that the paper will be published in the September 1976 issue of the *Journal of Oil and Colour Chemists' Association*.

Mr. CHRISTENSEN presented a literature study on the analysis of functional groups in amino resins. In the discussion Mr. TAWN emphasized the difficulties in removing the solvents from these labile resins and Prof. HAMANN noted that analytical work of high quality was also being done by resin manufacturers. The Working Party should specialize on analytical problems necessary for basic research, for

instance, of reaction mechanisms in the field of polymers used as binders for paints and printing inks.

It was mentioned by Prof. FUNKE, that further relevant problems could be seen in the determination of molecular weight and its distribution, while Mr. ZVONAR named the degree of crosslinking or activities of functional groups as other factors of that kind. Dr. SPOOR referred to work done in the American Cyanamid Co. about amino resins. The report presented should be made available to other workers, according to a suggestion of Mr. TAWN, and published after supplementation as a review of the state-of-the-art.

Adhesion Group

One of the reports given about work on adhesion problems was based on results of Dr. van LAAR and collaborators. The topic was the relationship between filiform corrosion and adhesion. The report revealed that Dannenberg's blister method, used by Dr. van LAAR, should in effect give the best connection with the corrosion phenomenon, as compared to the otherwise often used tear-off methods.

The various factors inherent to instrumentation and the operational modes of measurement were the theme of Dr. WAPLER's report. Mr. TAWN stressed that very often the results of adhesion tests are affected by film deformation and film rupture. Dr. OESTERLE made the point that in his experience each previous film deformation leads to a film of markedly changed properties, to which adhesion to the substrate would also belong. Amongst other factors bearing close connection to adhesion, the adsorption phenomena of water should be considered which, according to Prof. FUNKE's observation, should be studied in free as well as in supported films. There was general agreement in the Working Party that in-depth studies of adhesion should include the situation in film, substrate, and their interface as a whole.

Mr. FINK-JENSEN pointed to the fact that although instrumental measurement of adhesion is performed in many places, nobody seems to have doubted the existence of a relationship between measured adhesion and adhesion in practice. This interdependence is, however, not self-evident since the conditions of failure differ in the two cases in many respects, e.g. regarding geometry of forces, their origin, time scale, chemical effects, changes in temperature and humidity. It would be important to investigate which characteristics and properties are essential parts of the concept of adhesion in practice, so that measure-

ments of various kinds could be evaluated in the right way and possibly methods be created, which allow prediction of performance.

4. Programmes for Future Work

Solvent-Polymer Interaction

Mr. TAWN elaborated upon the importance of such studies for the food packaging industry as well as other industrial branches. Present studies took only highly diluted solutions into consideration. A starting point for new work should be seen in measuring the rate of evaporation of solvent, and how this is affected by both nature and structure of the solvent as well as the polymer. Methods applicable are gravimetry, radiotracer studies and gas-liquid chromatography. The first method needs a high accuracy of instruments because of the small quantities involved when solvent is retained, the second method is best suited for materials that can be dissolved again. The latter method offers the greatest variety in operational terms for such determinations.

In the discussion, Dr. OESTERLE suggested not only to consider solvent retention in the bulk material of the film, but to distinguish between the contributions of different layers of the film. A more physicochemical approach was proposed by Dr. WAPLER, with the activation energy of solvent released as most significant quantity to be measured. Prof. HAMANN referred to studies made in his institute in similar context and mentioned the related papers [*J. Oil Colour Chem. Assoc.* **54** (1971), p. 887; *FARBE & LACK* **77** (1971), p. 970]. Prof. BENOÎT suggested that the scope should not be limited too much on paint materials alone, and thus other Commissions in the Applied Chemistry Division might then be more easily attracted for cooperation. The composition of the group should remain virtually unchanged, with Mr. TAWN as the leader of the group, but with Prof. FUNKE joining it in the case of special questions on solvent retention. Mr TAWN proposed to prepare a scheme for further work, which to Prof. BENOÎT's suggestion, should be made public by IUPAC Secretariat. This would serve to obtain resonance from all those interested in this field. Mr. TAWN then would have the possibility to assign specific tasks to those persons or groups who have the pertinent facilities at hand, such as chromatographs, radiotracer systems, evaporimeters. The group leader could also invite other specialists to participate, if he feels the group can benefit from their particular experience.

Decisions taken. It was agreed that the group leader (Mr. TAWN) would work out and forward to the Chairman prior to 1 July 1976, a concise plan for carrying out the project. A circular letter would be prepared by Mr. TAWN and forwarded by the Chairman with the final project plan to other specialists within the field who might be interested in cooperating in the project. Thus, the communication might—following Prof. BENOÎT's suggestion—be forwarded to members of Macromolecular Division Committee. Possible participants should be asked to reply within 14 days after receipt of the letter.

Adhesion Group

The working programme was summarized by Dr. ZORLL. There was a certain need to come to greater understanding of the effects at the interface of two adhering materials on a molecular scale, since most information available is based on a more mechanical approach. Bringing molecular characteristics into discussion is closely connected to studying 'wetting effects', which are governed by the nature of the adhering materials in molecular terms such as polarity, hydrogen bonding effects and the like. Part of new work should be related to instrumental questions. As most instruments have only standard panels a need exists for measurement systems that can be used for practical objects but yielding adhesion data strictly in physical terms. For this purpose, SÄBERG's well-known instrument gives an illustrative example (see *Congress Book XII Fatipex-Congress*, 1974, p. 301).

Adhesion testing is of interest in many areas, so that even in the paint field further programmes must be restricted. Within this scope, there are however, several questions to be solved, related to the effects of pigmentation—pigment type and concentration—film thickness and other characteristics of the adhesion phenomena of thin organic coatings. Adhesion of such material to plastics would also fall into this complex of questions. This outline was accepted, in general, at the meeting and members expressed various views as to the items to be dealt with in first place. General agreement was reached that any results should be published as separate articles with reference to WSPF rather than condensing them into a single publication. As to the general perspectives of the work on adhesion Dr. OESTERLE emphasized the relevance of industrial interest in such problems, which ought to lead also to substantial support from industry. Carrying out adequate studies on existing literature was suggested by Dr. WAPLER in order to obtain a reliable basis from which the specific

problems may be approached. In this context, Dr. van LAAR mentioned his extensive survey of literature published some years ago (in HOUWINK-SALOMON, *Adhesion and Adhesives*, Chapter 20, Amsterdam 1965), so that only newer sources of literature should be taken into consideration.

This point of view was generally endorsed. Prof. HAMANN then made the suggestion that, as a specific task to be assigned to the group concerned with adhesion, a comparison between Dannenberg's blister method, as now used by Dr. van LAAR in a special mode, and the well-known tear-off method should be undertaken. He also proposed to combine such studies with others related to viscoelastic properties of the films, of which the adhesion is to be measured.

As far as adhesion on plastics is concerned, Dr WAPLER mentioned the principles of autohesion which were successfully applied by various researchers and could be useful also in these cases. Finally, Prof. BENOÎT referred to similar problems which are under discussion in other Working Parties in the Division, such as those concerned with materials used for elastomers, adhesives, etc. and he recommended to keep the general view in mind when studying adhesion of paint films. It would be still better to attempt to join efforts with other Working Parties in order to achieve results applicable on a more general scale. The Adhesion group maintained its composition with Dr. ZORLL as the group's leader; Dr. OESTERLE, being a corresponding member, suggested his role to be as a contact person to groups concerned with adhesion problems in his country.

Decisions Taken. It was agreed that the group leader (Dr. ZORLL) would follow the procedure described above. Compilation of a publication discussing practical adhesion as related to scientific concepts was decided to be the first objective. A further objective was to carry out the above mentioned experimental work concerning the comparison between the blister method and the tear-off method (Drs. ZORLL and van LAAR).

Analytical Group

The basis for further work was contained in the document circulated prior to the meeting. According to suggestions made during the meeting, Mr. CHRISTENSEN proposed to contact chemical firms as well as institutes before starting new work in the group in order to find out

the extent to which their laboratories might give support based on proprietary analytical developments.

Decisions taken. It was agreed that the provisional group leader (Mr. CHRISTENSEN) would follow the procedure described above. The first objective was a review article on the analysis of functional groups in amino resins.

Literature Retrieval Group

A new questionnaire will be sent, prior to 1 May 1976, to the institutions and organizations which have not returned the previous questionnaires. At the same time, copies of the previously received questionnaires will be returned for possible corrections and supplements. The literature publication will be based on material received before 1 July 1976.

Institutional Research Projects Group

Mr. RAASCHOU-NIELSEN—assisted by other members of the Working Party—will start work on this project after completion of the literature retrieval publication. Mr. TAWN acknowledged the value of such compilation even if it does not, and certainly will not, provide complete coverage, and suggested to prepare it in the form of a hand-out to the press, so that everybody willing to publish it may do so, with WSPF mentioned as source of information. It was decided to postpone decision for the present regarding the form in which such information can best be disseminated.

5. General Activities of Macromolecular Division

On the Chairman's invitation, Prof. BENOÎT elaborated upon organization and fields of interest of Macromolecular Division, with which the Working Party has been affiliated since 1973. Besides extensive experimental work being done in the Commissions and their special task groups, organizing of symposia of various forms, with either more general or in most cases particular objectives, is one of the Division's main activities. Prof. BENOÎT pointed to the fact that the Division in a strict sense is virtually the only international platform for the macromolecular field. WSPF could benefit from this position in the long run and should therefore attempt to establish links with other working groups of similar interest within the Division. He felt that

discussions at this meeting had shown that there were sufficient items to start with for such cooperation.

6. Membership and Scope of WSPSF

The discussion about membership resulted in suggestions to attract more specialists from East European countries. Mr. ZVONARŔ offered to explore the necessary contacts. As to further membership from other countries, Dr. OESTERLE thought it advisable to contact people working in the paint and printing ink industry. Prof. HAMANN pleaded for some rotation in the membership in order to maintain the group's capability to efficiently tackle other actual problems which may appear in the future. Mr. FINK-JENSEN emphasized that it would be up to the task group leaders to find 5-6 younger members before 1978. He furthermore mentioned, that the question of chairmanship ought to be considered in a not too distant future.

The discussion also revealed that the Working Party should, as in the years before, continue its efforts to become an essential link between national as well as regional associations within the coatings field.

7. New Objectives

In accordance with Macromolecular Division's objectives, the organization of symposia should be considered a further activity of WSPSF. Prof. HAMANN offered to take over the responsibility for such conferences. The first might take place during 1977. The general theme 'Adsorption and Desorption of Polymers on Surfaces of Solids' was unanimously agreed. Prof. Hamman would sustain the proposal under the condition that the financial basis for such symposium can be settled satisfactorily. He will try to find out possible ways by the end of 1976.

8. Date and Place of Next Meeting

No date was fixed for the next meeting, but agreement was reached that it should be held in Central Europe. The Chairman thanked Prof. BENOÎT for attending the meeting as well as for his valuable suggestions and explanations concerning the Working Party's relationship to the Macromolecular Division.

U. ZORLL

COMMISSION ON ANALYTICAL REACTIONS AND REAGENTS (V.1)

Paris, 11 May 1976

Present: Prof. R. BELCHER (Chairman), Prof. A. HULANICKI (Secretary), Dr. J. BARTOS, Prof. J. INCZÉDY, Dr. M. KAPEL, Dr. F. J. REIDINGER (Titular Members); Prof. G. den BOEF, Prof. F. LUCENA CONDE, Prof. F. PELLERIN, Dr. M. PESEZ (Associate Members).

1. Minutes of Previous Meeting

The minutes of the meeting held in Madrid on 3-5 September 1975 had been published in *Comptes Rendus 28th Conference: Part B*, pp. 249-252.

2. IUPAC-CEE Contract

Prof. PELLERIN described the present situation with regard to the 1977 contract, which will be settled this June. He indicated which methods may be considered by Commission V.1. In the general discussion it was pointed out that IUPAC should continue to maintain constant cooperation and to improve and shorten the discussion and circulation of methods. For this purpose it seems necessary to have a joint meeting with CEE scientists for revision, up-dating and development of methods.

After an extended discussion it was proposed to ask the Executive Secretary of IUPAC if a joint meeting could be held by Commission V.1, the Food Section and CEE scientists, who are responsible for assessing and proposing various methods. If this meeting could be arranged it should solve the outstanding problems. It was proposed that this meeting be held in 1976 or 1977 in Brussels, London or any place convenient to both IUPAC and CEE. The meeting should be held preferably in 1976 in order to expedite progress.

Furthermore, Commission V.1 asks IUPAC for the list of CEE scientists to enable some personal contacts to be made. Prof. BELCHER mentioned that Members of Commission V.1 need more details about the proposed methods. This would facilitate recommendations. Such detail should include: (i) What is the purpose of the method?; (ii) In which systems is the method usually applied?; (iii) What are the requirements on precision and accuracy?; (iv) Are the

methods to be used for single or for series determinations and therefore is more involved instrumentation needed?; (v) Is an instrumented method based on more expensive equipment not recommended?

The methods from the 1976 contract were discussed in detail taking also into account the comments sent in previously:

Methods 1/76 and 4/76. Prof. PELLERIN proposed MECA spectroscopy, which has been recently tested by Prof. BELCHER, be used. It was also suitable for aldehydes. Dr. KAPEL pointed out that probably this is only a purity test for SO_2 and therefore no elaborate methods are needed at all. Prof. BELCHER indicated that the need for special equipment may hinder the introduction of MECA spectroscopy for SO_3 determination in SO_2 . However, he would prepare sufficient data for circulation among members for comments within two months.

Method 5/76. Prof. PELLERIN presented the comments of members. It was felt that insufficient data were available because of the presence of two species in the preparation. The method would be completed also with remarks on the preparation of individual components of the developing reagent. Prof. PELLERIN being responsible for this method would after completion and some editorial changes (e.g. oxyde d'ethyle) send it to the Coordinating Committee. Prof. INCZÉDY mentioned about the possible use of liquid chromatography; however, it was agreed that the procedure should be as simple as possible.

Method 6/76. Prof. PELLERIN started the discussion by presenting the collected comments. It was stated that it is necessary to introduce corrections to provide the proper dilutions for optimal value of measured absorbance, and also the necessary precision of prepared solutions, e.g. 0.0050 g instead of 0.005 g. Dr. KAPEL queried the proper formulation of the title of this method which should be given as e.g. 'Spectrophotometric Determination of Some Antioxidants', because the present title may suggest improperly that the main purpose is determination of absorbance. Prof. PELLERIN was assigned the responsibility for clearing this matter.

Methods 2/76 and 3/76. The main problems with organic chlorine determination comes from the fact that it is determined as a difference from limit tests. In discussion Prof. BELCHER, Dr. PESEZ, Prof. INCZÉDY and Dr. KAPEL pointed out that the final determination should be made either volumetrically (Volhard) or turbidimetrically.

Prof. PELLERIN mentioned that the latter version would be included and the method tested for final assessment. Drs. BARTOS and PESEZ should make some experiments in this respect as well as examine the possible losses of organic chlorine compounds. Further comments were presented mainly by Dr. KAPEL on the use of a desiccator and the light sensitivity of AgCl.

In concluding the discussion Prof. PELLERIN informed the members that he will arrange to submit methods for the new contract.

3. Other Projects

Redox Indicators. Prof. HULANICKI presented the introduction to the report, which was accepted; also accepted was the addition of the subject indexes according to the decisions reached in Madrid. The answer to the comments to Prof. T. S. WEST was discussed and in general accepted. The term 'titrand-analyte' is still doubtful and Prof. BELCHER will clear this and introduce the proper term in the whole report. The final version needs no more correction and will be sent by Prof. BELCHER to the Secretariat for publication.

Compleximetric Indicators. The report presented by Prof. HULANICKI has been extended by six new indicators. This will be circulated through the IUPAC Secretariat for comments, which should be sent to Prof. HULANICKI before 30 September 1976. According to the remarks of Profs. INCZÉDY and den BOEF the one and two colour indicators should be distinguished, and extraction indicators should be mentioned. The title of the report should be changed according to IUPAC recommendations. Prof. PELLERIN suggested that he completed temporarily the report with a limited number of indicators, and later enlarged it for new items.

Non-aqueous Acid-Base Indicators. Prof. PELLERIN reported that in the report criteria of purity should be given and asked the members for methods for testing the indicators. Experimental results obtained by Prof. PELLERIN will be presented in January 1977.

Determination of Polyphenolic Compounds. Prof. PELLERIN reported that this will be limited to simple phenols used as antioxidants and should not include flavonoids or catecholamines. This report will be available in October–November 1976.

Expression of results in Colorimetry and Fluorimetry. The report was discussed in view of comments sent by the Analytical Chemistry

Division. Dr. BARTOS will prepare his observations and send them to the IUPAC Secretariat for distribution, as also for distributing the whole set of documents concerning this report among the new members of Commission V.1.

Amine Determination. Dr. KAPEL stated that this will be homogenized at the end of September 1976 and then presented in its final form.

Traces of Organostannic Compounds and Metal Traces in Food Additives. The report will be prepared for the IUPAC Conference in Warsaw (1977), but it will be sent before to the members for comments in April 1977. Prof. BELCHER mentioned that in the IUPAC programme the project on *fluorimetry of phenolic function* has probably been included by mistake, as it was never suggested by the Commission. Prof. BELCHER will clear this with Executive Secretary, IUPAC.

Primary Standards for Titrimetric Analysis. Prof. BELCHER indicated that the report prepared by the AMC (AD/CS) as a cooperative study on sulphamic acid and confirmed by Commission V.1 has been rejected by ISO without any reasons given to IUPAC. This should be reconsidered by Commission V.1 and presented once more for consideration with the original procedure. This may be due to lack of proper liaison with ISO, and that an IUPAC representative should have been present.

A. HULANICKI

IUPAC-IUB COMMISSION ON BIOCHEMICAL NOMENCLATURE (CBN)

New York, 31 May-3 June 1976

Present: Prof. O. HOFFMAN-OSTENHOF (Chairman), Dr. W. E. COHN (Secretary), Prof. A. E. BRAUNSTEIN, Dr. H. B. F. DIXON, Dr. B. L. HORECKER, Dr. W. B. JAKOBY, Prof. P. KARLSON, Prof. E. C. WEBB. Dr. K. L. LOENING participated as an observer from the IUPAC Commissions on Nomenclature of Organic Chemistry (CNOC) and Macromolecular Nomenclature (CMN), Dr. R. DYBKAER as an observer from IUPAC Commission on Quantities and Units in Clinical Chemistry (CQUCC), and Prof. W. G. WHELAN as Secretary of IUB and Dr. H. TABOR as Secretary of IUB Commission of Editors of Biochemical Journals (CEBJ).

1. Minutes of Previous Meeting

The minutes of the meeting held at Dorking, UK on 9–12 June 1975 [see *Information Bulletin* Nos. 52/53 (May 1977), pp. 30–33] were approved.

2. Chairman's Report

HOFFMAN-OSTENHOF reported that: (i) the Peptide Hormone document had been published in Russian; (ii) the 2nd edition of the Compendium of CBN documents, compiled by *J. Biol. Chem.*, had been published (*ca.* 1500 copies have been sold to date); (iii) the first Supplement to *Enzyme Nomenclature* (1972) had appeared in *Biochim. Biophys. Acta*, **429**, 1–45, 1976 (the total number of entries, allowing for deletions, is 1974); (iv) KLYNE had resigned from CNOC; (v) he (H-O) intended to resign as Chairman of CBN in the near future (KARLSON was elected 'Chairman-elect' as against that eventuality); (vi) the Interdivisional Committee on Nomenclature and Symbols (IDCNS) has been reorganized with LOENING as Chairman; (vii) IDCNS and CNOC preferred that CBN remained a joint IUPAC–IUB body as at present [see Minute 7 (i) and (ii)].

3. Reconsideration of Previously Published Documents

(i) A draft revision of '*Abbreviations and Symbols*' (1965) was received from DILLMAN. The previously appointed subcommittee (LIÉBECQ, convenor; COHN, DILLMAN and KLYNE) will proceed to develop a document from this draft, based on CBN review of the DILLMAN draft.

(ii) '*Peptides*' (1971 Revision): no direct comments had been received, but a review by WUNSCH in which abbreviations for many unusual amino acids and substituents had been introduced was referred to all members of CBN and advisors for study and recommendation.

(iii) '*Vitamins*' ('Miscellaneous Compounds', 'Quinones', 'Tocopherols', 'Vitamin B-6', 'Corrinoids'): certain amendments and changes to bring CBN documents into agreement with the evolving IUNS document (discussed by representatives of CBN and IUNS at a meeting in Rochester, N.Y., the week before) were presented and approved. An 'Addenda and Corrigenda' will be drafted by COHN for final approval and publication within 1976.

(iv) '*Amino Acids*' (joint with CNOC): a proposed revision of the section on 'allo' was discussed, approved, and referred to CNOC for its approval. A 'Corrigendum' was contemplated.

(v) '*Peptide Hormones*': Note was taken of some strong but ill-defined adverse comments received from a number of endocrinologists, also a comment that CBN's document took no note of the names proposed (for a few items) by WHO(INN). Any revision by CBN should await collection and analysis of all comments.

(vi) '*Multiple Forms of Enzymes*': see Minute 4 (iii).

(vii) '*Iron-Sulfur Proteins*': see Minute 5 (i).

(viii) '*Enzyme Nomenclature*'.

A. *Supplements*: the first supplement to *Enzyme Nomenclature* (1972) had been completed and published [see 2(iii)]. Questions as to cost and copyright were raised and are to be resolved before a second supplement is issued. *J. Biol. Chem.* proposes to include it in a third edition of the Compendium [see 2(ii)], if the copyright problem is resolved. WEBB reported that input (new entries or corrections) has dropped off; more publicity is needed, and CEBJ and the various societies will be asked to help. A second supplement should be published in 1977 or 1978. In view of the longer time between supplements than originally planned, a new and complete revision will probably be needed after only two supplements; this new volume should be ready in 1979 or 1980. The possibility of production of the list from computer copy is to be examined by JACKOBY (NIH computer), LOENING (Chemical Abstracts Service) and WEBB (University facilities in Sydney); JACKOBY will collect and evaluate the information.

B. *Some difficult cases* (outlined by WEBB in CBN-1976-3) were discussed. Included were: (a) 'Chlorate reductase': to be included in subgroup 1.99; (b) 'thiol-disulfide transferases': these enzymes to be left in existing positions, in subgroup 1.8.4, but with a cross-reference from EC 2.5.1.18; (c) superoxide vs. hyperoxide: superoxide to be retained; (d) nomenclature for EC 2.5.1.17 entry: this should be brought into line with the cobalamin document; (e) carbamoyl phosphate synthases (EC 2.7.2.5 and 9) should be reclassified in group 6.3, as synthetases; (f) for 'restriction' enzymes, a separate working group should be set up; (g) β -cyanoalanine synthase (EC 4.4.1.9) should be reinstated, and the cross-reference from EC 4.2.99.8 deleted; (h) systematic names for prostaglandin isomerases: no action to be taken about basing these and the listed reactions, on full chemical names until the report of the prostaglandin sub-committee has been finalized;

(i) pseudouridylate synthase: to be included as a lyase in sub-group 4.2.1; (j) *sn*-numbering for all phospholipid entries (e.g. EC 3.1.4.2, 3.1.4.38, 3.3.2.2 and 3.6.1.26). Chairman will provide the necessary information.

C. Proteinases: a report from KEIL was received, suggesting the creation of new sub-groups 3.4.12A and 3.4.12M from the present 3.4.12; WEBB will redraft this with sub-groups 3.4.15 and 3.4.16, and KEIL will then be asked to proceed.

D. Oxygenases: a detailed criticism of the classification of tyrosinase, laccase, etc., by MALMSTRÖM requires expert attention (JACKOBY is to pursue this); in the meantime, no changes.

E. Enzyme Units: The definition of K_m is to be refined by DIXON and made an addendum to chapter 5 of *Enzyme Nomenclature*. The 'katal' will be defined as 'that catalytic activity that catalyzes a rate of reaction of one mole per second in a specified assay system.' General agreement was reached on the revision of the chapter on Enzyme Units (chapter 4), which has been simplified on the basis of recent versions from LIÉBECQ and DIXON and is now issued as CBN-1976-6, class 3.

F. Multiple Activities (in a single peptide chain). Correspondence (CBN-1976-4) was reviewed. It was decided to name the enzyme as a synthetase of the final product, namely formyl-methenyl-methylene-tetrahydrofolate synthetase.

4. Documents Nearing Completion

(i) '*Phosphorus Compounds of Biological Importance*' (Biochem. P-Rules), in pre-final form, was discussed in detail. Minor revisions and one addition were made to Table I (simple esters) and choices were made among the various alternative names for the complex compounds in Table II. The 'suffix form' column was removed from Table V, and one entry was moved from Table VIII to Table VI. The document is now ready for approval by IUPAC and IUB and publication in the usual manner.

(ii) '*Nomenclature of Lipids*' in nearly final form, was discussed in detail. 'Sphingoid' was approved as a preferred alternative to 'sphingoid base' and 'long-chain base'. Lip. 1.10 was rewritten to recommend fully systematic names (involving *R/S*, *E/Z*, etc.) for configurational isomers of sphinganine, and these names were placed under the relevant structures and in the examples. A comment on phosphorylated inositols was added (to Lip. 2.4). 'Plasmalogenic' was changed to

'plasmenic', and 'lysoplasmenic' and 'plasmanic' were approved. It was agreed to suggest, rather than to recommend, the contraction 'glycerone' and the symbols Gro, Gra, Grn and Gri as useful in certain circumstances. A definition of 'ganglioside' was added to Lip. 3.10 and an Appendix C (Abbreviated Representation of Gangliosides), prepared by KARLSON, was added. Minor modifications of the text and appendices were also made. *Lipids* will be circulated once more for formal comments, then submitted for the approval of Unions and publication in the usual manner.

(iii) '*Multiple Forms of Enzymes*' (1976 Revision), was reviewed in detail and some formal changes were made. The new version will be circulated to CBN and CEBJ as 'class 3' (formal changes only).

(iv) '*Conformation of Polysaccharides*'. The document prepared by MARCHESSAULT *et al.* (SCBN/PS/7) was accepted and is to be circulated, with KLYNE's few comments, to CBN and CEBJ as a class 2/3 document (class 2/3 because of extensive circulation of earlier drafts).

(v) '*Conformation of Polynucleotides*'. The earlier rough draft (CBN-1975-8) had not progressed pending a decision on the designation of the torsion angles of the internucleotide bonds. The three proposed systems (ϕ, ω, ω' ; ϕ', ψ', ψ'' ; $\alpha-\zeta$ #1; $\alpha-\zeta$ #2), were discussed by CBN and $\alpha-\zeta$ #1, which begins with C3'—O3' and proceeds via the P towards the C5 of the next sugar, was chosen as the one involving the least memorization. The draft is to be revised (by COHN) in this form and circulated as a class 2 document to CBN and CEBJ.

(vi) '*Tetrapyrroles*' (joint with CNOC) was approved and is in the hands of CNOC. CEBJ is not predisposed to print such a long, complex, and largely chemical document. It is proposed to approach a chemical journal (e.g. *J. Org. Chem.*), or to construct an abridged version.

5. Projects in Earlier Stages of Development

(i) *Iron-Sulfur Proteins* (Revision of 1973 Recommendations). A report from BEINERT *et al.* was received and discussed. JAKOBY will rewrite this in CBN form as a class 2 document for circulation to CBN and CEBJ.

(ii) *Prostaglandins*. Thromboxane nomenclature was discussed by KARLSON, who will prepare a class 2 document to go to the Working Group, CBN, and CEBJ.

(iii) *Cytochromes*. A report has been received from M. D. KAMEN, Convenor of the Working Group, that may form the basis of a document.

(iv) *Carbohydrates* (products of the CNOC-CBN Subcommittee on Carbohydrate Nomenclature, H. PAULSEN, convenor, and joint between CNOC and CBN).

- A. *Revision of Carbohydrate Nomenclature I* (1969) is still in the hands of the Subcommittee.
- B. *Monosaccharide Conformations*: approved by CBN.
- C. *Branched-Chain Carbohydrates*: approved by CBN.
- D. *Unsaturated Saccharides*: approved by CBN.
- E. *Polysaccharide Nomenclature* (glycan and poly nomenclature): the Subcommittee proposes to abandon this project.
- F. *Abbreviated Terminology of Oligosaccharide Chains*. (see Oligo/1, 22 September 1975, from H. PAULSEN to the Subcommittee). The Subcommittee has abandoned work on this project. CBN may undertake it, as it follows logically the work already completed on the complex glycolipids (Minute 4.2) and its earlier work on Abbreviations and Symbols (Minute 3.1).

6. New Projects

(i) *Biogenic Amines*: a Working Group, including AXELROD, CARLSSON, BLETSCHER, SANDLER, UDENFRIEND von EULER, WEINER, WINKLER, and WITKOP, with LOVENBERG as conveyor, has been organized.

(ii) *Non-enzyme proteins*: several sub-groups are being organized; two of these will be concerned with coagulation zymogens (KEIL), snake-venom toxins (B. BANKS).

(iii) *Multienzyme complexes* are to be examined with a view to placing a tabulation of them in *Enzyme Nomenclature*. L. REED and KARLSON were suggested as convenors.

(iv) *Lipoproteins*. H. EDER has accepted the convenorship of a working group. He is selecting members for this group and hopes to report within a year. HORECKER will maintain CBN's liaison with the group.

7. Other Business

(i) A motion to petition IUPAC and IUB to retain the present form of CBN as a joint commission was adopted by a vote of 7 for, none

opposed, 1 abstention (2 members were not at the meeting). A joint commission avoids an arbitrary and often senseless division of fields, avoids duplication of effort and potential conflict, makes collaboration easier, gives greater authority to recommendations, facilitates dissemination of recommendations.

(ii) A motion to petition IUPAC to allow CBN to report to IDCNS (rather than to Divisions III and IV, as at present) was adopted unanimously by the 8 members present. This would, in CBN's view, simplify and speed the processing of finished documents.

(iii) CBN discussed the fact that its responsibilities extend beyond CEBJ and its titular member-journals, including, among others, nutritionists, drug manufacturers, clinical chemists, official agencies (WHO, FDA), and many sub-specialities. CBN's concerns range from chemistry to the clinic.

(iv) CBN opted for Italy in the third week of May for its 1977 meeting.

W. E. COHN

COMMISSION ON TOXICOLOGY IN CLINICAL CHEMISTRY (CToCC)

London, 2-3 June 1976

Present: Prof. F. W. SUNDERMAN, Jr. (Chairman), Dr. S. S. BROWN, Prof. M. J. MERCIER (Titular Members); Dr. A. NOIRFALISE, Dr. D. B. TONKS (Associate Members). Dr. D. BARLTROP, Dr. M. STOEPLER, Dr. M. WEBB, Dr. J. CLARY, Mr. R. J. M. RATCLIFFE (Observers).

1. Minutes of Previous Meeting

The minutes of the meeting held in Madrid 4-6 September 1975 (see *Comptes Rendus 28th Conference: Part B*, pp. 149-154) were approved.

2. International Symposium on Clinical Chemistry and Chemical Toxicology of Metals

Dr. BROWN reported that 20,000 copies of the first circular for the meeting had been distributed; 300 reply cards had been returned, with

140 positive replies regarding an intention to submit an abstract. Dr. BROWN distributed draft copies of the Second Circular of the Monte Carlo Symposium, as well as draft copies of the abstract form. The draft second circular was approved with minor changes, including the inclusion of a plenary lecture on 'Arsenic Poisoning' by Dr. SAVORY. The deadline for receipt of abstracts was set at 1 December 1976.

Detailed Consideration of Plenary Lectures

Drs. BARLTROP, STOEPLER and WEBB presented in detail the topics and scope of their respective plenary lectures. Particular concern was expressed that Dr. GOYER's lecture on 'Cellular and Tissue Toxicology of Metals' should emphasize morphologic changes in order to minimize overlap with the biochemical changes to be described by Dr. WEBB in his lecture on 'Metabolic Targets of Metal Toxicity' and the aspects of metal distribution and kinetics to be described by Dr. NORDBERG in his lecture on 'Metabolism of Toxic Metals'.

Organization of Scientific Sessions

After extensive discussion, it was decided to extend the Monte Carlo Symposium for an additional day in order to accommodate additional submitted papers. Accordingly, the dates of the Symposium will be Wednesday to Saturday, 2-5 March 1977. After much discussion, the following candidates were identified for Co-Chairmen of the scientific sessions:

Wednesday, 2 March:

Plenary Session: Prof. SUNDERMAN (USA) and Dr. HERNBERG (Sweden)

Scientific Session A: Dr. BROUGHTON (UK) and Dr. MERCIER (Belgium)

Scientific Session B: Dr. STOEPLER (FRG) and Dr. CALI (USA)

Thursday, 3 March:

Plenary Session: Dr. BROWN (UK) and Dr. KAWAI (Japan)

Friday, 4 March:

Plenary Session: Dr. TONKS (Canada) and Dr. LAUWERYS (Belgium)

Scientific Session C: Dr. NOIRFALISE (Belgium) and Dr. SPIEGEL (USA)

Scientific Session D: Dr. RUBIN (USA) and Dr. POSMA (Holland)

Saturday, 5 March:

Scientific Session E: Dr. SAVORY (USA) and Dr. HUMOLKA (Poland)

Scientific Session F: Dr. CLARY (USA) and Dr. EDWARDS (Australia)

Prof. SUNDERMAN was authorized to invite these scientists to serve as Co-Chairmen of the respective sessions. In the event that any of these scientists were unable to serve, Prof. SUNDERMAN was authorized to select alternatives. Dr. J. CLARY (E. I. DuPont Company, Wilmington, Delaware) and Dr. RECHT (Health Protection Directorate of the Commission of European Communities, Luxembourg) were appointed as members of the Symposium Organizing Committee.

Publication of Abstracts and Proceedings

Dr. BROWN reviewed his plans for publication of the Abstracts and Proceedings of the Monte Carlo Symposium. The abstracts will be printed by photo offset by Dr. BROWN and Mr. RATCLIFFE. The Proceedings will be published by either Elsevier or Pergamon Press under Dr. BROWN's editorship. Dr. BROWN was authorized to proceed with the negotiations with these publishers, since formal release of publication rights for the Symposium Proceedings had been granted by IUPAC.

In order to arrange the scientific programme, it was unanimously decided that a meeting of the Commission and Symposium Organizing Committee would be essential as soon as possible after the abstract deadline of 1 December 1976. Tentative plans were made to hold a meeting during the first week of December 1976, either in Iceland or North America, contingent upon approval of a request from Prof. SUNDERMAN to the Section on Clinical Chemistry and the IUPAC Secretariat to expend the Commission's allocated travel funds in the 1976 Budget for this purpose.

3. Activities of Subcommittees

Subcommittees on Measurements of Serum Cholinesterases

Dr. BROWN reported that his subcommittee was making steady progress in the drafting of a review document on measurements of cholinesterase activity in serum. Consideration was focused upon the most appropriate vehicle for publication of this document, and it was

decided that Dr. BROWN should petition the IUPAC Secretariat for permission to publish it in '*Advances in Clinical Chemistry*'. A list of names of the members of the subcommittee was approved by the Commission.

Subcommittee on Environmental and Occupational Toxicology of Nickel

Prof. SUNDERMAN reported on the two interlaboratory surveys of nickel analysis in biological fluids that had already been completed by his subcommittee, and he distributed the agenda for the first formal meeting of the subcommittee in London on 4 July 1976. Prof. SUNDERMAN reported that the subcommittee on Nickel was engaged in two major projects: (i) development of a reference method for measurement of nickel in biological materials by means of electrothermal atomic absorption spectrometry, and (ii) drafting a monograph on 'Environmental and Occupational Toxicology of Nickel' for publication in the IUPAC journal, *Pure and Applied Chemistry*. A list of the names of the members of the subcommittee was approved by the Commission.

Subcommittee on Atomic Absorption Spectrometry of Lead in Blood

Since Dr. BOURDON was unable to attend the meeting, no report was available on the activities of his subcommittee. Prof. SUNDERMAN agreed to ask Dr. BOURDON for a report on the activities of the subcommittee on Lead.

Proposals for Additional Subcommittees

The Organizing Committee of the Monte Carlo Symposium was established as a subcommittee of the Commission on Toxicology, with Prof. SUNDERMAN as Chairman, in order that the organization chart of the Commission on Toxicology would conform to the normal IUPAC structure. A list of the names of the members of this subcommittee was approved by the Commission.

4. Future International Symposia

Mass Spectrometry/Gas Chromatography of Drugs, Toxic Agents and Metabolites in Biological Materials

Dr. MERCIER agreed to serve as Program Chairman of this International Symposium, which is tentatively scheduled to be held in Western Europe during the Spring of 1979. Dr. MERCIER agreed to contact Dr. FRIGERIO to inquire about cooperation with the annual

European Regional Meeting on the topic. Dr. MERCIER also agreed to serve as the Editor of the Proceedings of the Symposium, which would hopefully be published as soon as feasible after the meeting.

Chemical Indices of Organ-Specific Toxicity

Dr. BROWN agreed to serve as Program Chairman of this International Symposium which is tentatively scheduled to be held in UK, Scandinavia or Western Europe during the Spring of 1981. Dr. BROWN agreed to begin to formulate plans for the meeting, and he also agreed to serve as Editor of the Proceedings.

5. Relationships with Other IUPAC Bodies

Prof. SUNDERMAN summarized the current activities of other Commissions of the Section on Clinical Chemistry, and discussed plans for the next meeting of the Section in Warsaw, 27–31 August 1977, during the 29th IUPAC General Assembly. It was decided that the Commission on Toxicology should request 3½ days of meetings at the Warsaw General Assembly, including two days for the Commission on Toxicology, one day for the Subcommittee on Nickel, and a half-day for joint meetings with other groups (including the Section on Air Quality).

6. Future Meetings of the Commission

Future meetings of the Commission are planned as follows: (i) Early December 1976—Iceland or North America; (ii) 2–5 March 1977—Monte Carlo, Monaco; (iii) 27–31 August 1977—Warsaw, Poland.

F. W. SUNDERMAN, Jr.

SUBCOMMITTEE ON ENVIRONMENTAL AND OCCUPATIONAL TOXICOLOGY OF NICKEL OF CToCC

London, 4 June 1976

Present: Prof. F. W. SUNDERMAN, Jr. (Chairman), Dr. S. S. BROWN, Dr. J. J. CLARY, Dr. J. MEININGER, Dr. L. G. MORGAN, Dr. M. STOEPLER, Dr. H. ZACHARIASEN (Members). Dr. D.

ADAMS, Dr. R. T. BARTON, Dr. R. BOURDON, Dr. N. GUNDERSEN, Mrs. R. WARD, Mr. G. WILLIAMS, Mr. J. WOODWARD (Invited Participants). Mr. G. L. J. BAILEY, Mr. D. M. EDWARDS, Dr. H. EGAN, Mr. D. J. PHILLIPS, Dr. D. B. TONKS, Mr. G. URSELL-SMITH (Participated in part).

1. Organizational Structure and Statutes of IUPAC, Including the Section on Clinical Chemistry and the Commission on Toxicology

Prof. SUNDERMAN opened the meeting by explaining the structure and functions of IUPAC. He stated that the purpose of the Subcommittee was to concentrate on practical problems related to the environmental and occupational toxicology of nickel, and that to this end the current objectives were: (i) By the practice of interlaboratory discussion and comparison to establish a generally acceptable reference method for analysis of nickel in biological materials. (ii) To prepare a monograph on 'Environmental and Occupational Toxicology of Nickel' to be published in association with IUPAC Symposium on Clinical Chemistry and Chemical Toxicology of Metals to be held in Monaco on 2-5 March 1977.

2. Results of the First Interlaboratory Comparison of Nickel Analyses (in Plasma)

Dr. ZACHARIASEN presented the results of the first survey. The agreement between laboratories was reasonably good and was judged to encourage further activity. Only three laboratories had been able to participate in this initial survey, which was distributed on 28 March 1976. Dr. ZACHARIASEN noted that he had used heparinised blood and that he had a source of heparin that was low in nickel.

3. Results of the Second Interlaboratory Comparison of Nickel Analyses (in Urine)

Mr. ADAMS presented the results of the second interlaboratory survey which was directed to analyses of nickel in urine specimens that were distributed on 3 May 1976. Again, the agreement between the laboratories was reasonably good and encouraged further activity. Mr. ADAMS outlined the Clydach technique involving wet ashing with a small quantity of nitric acid and extraction with ammonium pyrrolidone dithiocarbamate, and he also outlined the Copper Cliff method involving direct flameless atomic absorption.

4. *Protocols for Atomic Absorption Analyses of Nickel in Body Fluids by Modification of the Technique of Zachariassen et al.*

As each participant discussed his routine method, it was apparent that there was considerable variation in technique, and that the principal matters to be decided in developing a reference procedure were (a) dry ashing versus acid digestion; (b) dimethylglyoxime chelation versus ammonium pyrrolidone dithiocarbamate chelation; and (c) essentiality or non-essentiality of background correction and temperature ramping for flameless atomic absorption. It was generally considered that the initial effort should be concentrated upon analysis of nickel in urine, and that applications of the reference method to analysis of blood, other biological fluids, excreta and tissues would be considered subsequently.

5. *Instrumental Refinements That May Enhance the Sensitivity and Precision of Nickel Analyses by Electrothermal Atomic Absorption*

Dr. STOEPLER explained the activities of his research group and how they could help the committee's activities. The Julich Nuclear Research Centre is a government-sponsored organization and he is head of the Section for Environmental Research. He has currently been involved in investigating the application of pyrolytic graphite tubes to nickel analysis and stated that he would collaborate with a research worker (Dr. ADLER) on this project during the next year. He was also studying the application and benefits of automatic sampling and believed that this would show a marked improvement in accuracy and precision.

Dr. STOEPLER requested guidance from the committee concerning the importance of trace metal research in environmental studies, as the supervisory board of K.F.A. is going to review expenditure on this type of work. He himself saw it as the application of nuclear techniques for the optimization of analytical methods with particular reference—from the point of view of this committee—to nickel in body tissues and fluids.

6. *Methodological Approaches and Statistical Problems in Validation of the Proposed Reference Method for Nickel Analysis*

Dr. BROWN detailed the procedure for developing a 'reference' method for clinical analysis as agreed by the International Federation of Clinical Chemists using as an example the development of the method for serum calcium. In the final situation, the laboratories in the fields have their working methods—these they can check against a

reference method which has a high level of accuracy and reproducibility because it involves standard techniques, procedures and materials. There are generally a number of laboratories capable of using the reference method in each country. The reference method is itself checked against a 'definitive' method which will use highly sophisticated and specialized techniques and there will generally only be one or two units in each country where this method can be applied.

There was some discussion about Dr. BROWN's paper in which Prof. SUNDERMAN stated that the current studies were aimed at the middle rung of Dr. BROWN's ladder (e.g. a 'provisional reference method'). Mr. ADAMS reminded the subcommittee that working laboratories require a degree of precision that will be commensurate with needs of clinical and epidemiological studies, bearing in mind the natural biological variables and problems of collection. Dr. SUNDERMAN suggested that a practical goal should be a coefficient of variation of 5% in the 2-10 $\mu\text{g/l}$ range of concentration.

Mr. WOODWARD discussed the latest developments in the field, including (a) pyrolytic graphite tubes, previously mentioned by Dr. STOEPLER, (b) the autosampler—this instrument avoids problems of operator variability and always samples from the same place—it should give a $\times 2-3$ increase in precision, (c) the pyrolytic graphite tubes—these give advantages in increased sensitivity of $\times 3-4$ for aqueous solutions. Perkin Elmer is currently recommending that users coat their own tubes using methane/argon.

7. *It was agreed:* (1) that the method to be adopted for further development as a 'reference' method involve (a) destruction of organic materials by either acid digestion or dry ashing; (b) chelation of nickel with either dimethylglyoxime or ammonium pyrrolidone dithiocarbamate; (c) extraction of the chelate into methyl isobutyl-ketone or a similar solvent; and (d) flameless atomic absorption spectrometry. Particular attention will be given to the technique of ZACHARIASEN and coworkers and to the protocol distributed by Mr. ADAMS. (2) During the next six months the participating laboratories would critically evaluate the several parameters of the analytical method in order to identify the optimal conditions for nickel analysis. Particular reference will be placed upon avoidance of interference by iron and other metals and to minimizing matrix effects, so that the method will ultimately be applicable to blood and tissues, as well as urine. (3) In October 1976, the Clydach team will prepare a further set of urines for a second 'round robin'. The preparation would use the same protocol as the April 1976 'round robin' with the

addition of 1 aqueous sample and the distribution of a sample of nickel powder from which each laboratory could prepare its own standard. (4) During the period, those laboratories who can will also study the possibility for normalization of results of nickel analyses in urine against urinary creatinine, 7-methylguanine or refractive index.

8. *It was agreed* that the Committee's monograph should be published in the IUPAC journal, '*Pure and Applied Chemistry*' and that Prof. SUNDERMAN would also seek permission to republish any items considered relevant in analytical or clinical journals.

9. *It was agreed* that the format of the monograph should be revised. The members of the subcommittee who were present suggested the titles of sections that they would each be willing to draft. Prof. SUNDERMAN agreed to compile these suggestions with the topics that might be covered by the absent members of the subcommittee, and to draft a revised outline of the monograph for consideration at the next meeting of the subcommittee.

Membership

Dr. MORGAN was elected Secretary and Dr. BARTON and Mr. ADAMS members of the subcommittee.

Next Meeting

Prof. SUNDERMAN proposed that the next meeting should be in Reykjavik, Iceland in December 1976. Dr. BARTON stated that the Falconbridge Company would like to invite the committee to Norway, but Dr. SUNDERMAN stated that it had already been agreed to have the organizational committee in Iceland as this would incur the least travel expenses for delegates and, having asked Dr. BARTON to thank the Falconbridge management for their kindness, suggested that the committee could accept their hospitality at some future date.

L. MORGAN
F. W. SUNDERMAN, Jr.

COMMISSION ON NOMENCLATURE OF INORGANIC CHEMISTRY (II.2)

Paris, 20–24 June 1976

Present: Prof. J. CHATT (Chairman), Dr. D. M. P. MINGOS (Secretary), Prof. L. F. BERTELLO, Dr. K. C. BUSCHBECK, Prof. Y. JEANNIN, Dr. G. J. LEIGH, Dr. B. F. MYASOEDOV, Dr. W. H. POWELL (Titular Members); Prof. W. C. FERNELIUS, Prof. K. YAMASAKI (Associate Members); Prof. E. FLUCK and Prof. K. SAITO (National Representatives); Prof. E. W. ABEL, Dr. J. R. DILWORTH, Prof. E. SAMUEL (Observers).

Meeting of Titular Members

1. The Chairman sought the advice of the Commission concerning the course of action to take should IUPAC not provide sufficient funds to cover all the expenses of Titular Members attending meetings. The Commission decided that it would be preferable to hold restricted meetings for working parties under conditions of financial stringency than to discriminate on geographical grounds.

2. It was decided to allow Associate Members to vote on all nomenclature matters, except the heavy element names, and to encourage all present to participate in the discussion.

The Chairman pointed out that several vacancies for Associate Members would occur next year. The Commission agreed to request that the number of Associate Members be increased from 8 to 12 in order to provide sufficient places for active ex-Titular Members and potential Members who had expressed interest in the Commission's work. The Chairman asked Members to forward the names of suitable candidates for Associate Membership to the Secretary. It was decided to encourage National Representatives from countries which had less representation in the Commission.

Full Meeting of Commission

3. The minutes of the previous meeting held in Santiago de Compostela, 27 August–2 September 1975 [see *Information Bulletin* Nos. 52/53 (May 1977), pp. 37–44] were approved after minor amendments.

4. The Chairman noted with regret the deaths of Profs. S. VEIBEL and T. ERDEY-GRUZ.

Systematic Names of Heavy Elements

5. The Secretary reported on the Bureau's recent agreement concerning the publication of systematic names of heavy elements starting with element 101 as a tentative document. [*Editorial Note:* This has since been published as Provisional Nomenclature Appendix No. 55 (December 1976) to IUPAC *Information Bulletin*]. The position regarding the right of the discoverer to suggest a name for the element remains to be clarified. The Commission deprecated the allowance of the use of the abbreviated names, because their use would destroy the simplicity and ease of understanding of the completely systematic nomenclature proposed by the Commission.

Nomenclature of Inorganic Chemistry and Supplement

6. Prof. FERNELIUS reported that he was currently preparing camera-ready manuscript of *How to Name an Inorganic Substance* and a revised and enlarged Table for 'Names for Ions and Radicals' [*Editorial Note:* The book has since been published as a Supplement to *Nomenclature of Inorganic Chemistry* by Pergamon].

7. The programme for the revision of the 'Red Book' was discussed. It was agreed that an analysis of the 'Red Book' should be undertaken to identify errors, omissions, and deficiencies. This should be based on information from translators and also the comparative analyses being undertaken by *Chemical Abstracts*. It was decided not to appoint a working party immediately, but that Profs. YAMASAKI and JEANNIN and Drs. BUSCHBECK and POWELL should collect relevant information and pass it on to the Secretary in time for him to report next year. In the meantime Pergamon should be discouraged from reprinting the 'Red Book'.

Relationship with IDCNS and CNOC

8. Prof. FERNELIUS reported on the meeting of the Interdivisional Committee on Nomenclature and Symbols (IDCNS). The Committee sees its role as coordinating the general work of the IUPAC Nomenclature Commissions, to aid in the dissemination of documents and to stimulate nomenclature development as it sees the need. It does not wish to slow down nomenclature work but to advise and illuminate. IDCNS had approved in principle a systematic scheme such as the one proposed by this Commission for undiscovered heavy elements. It

intends to hold an open meeting during the 29th IUPAC General Assembly in Warsaw (August 1977).

9. Dr. POWELL reported on Meeting of Commission on Nomenclature of Organic Chemistry (CNOC) held at Deauville. Points of immediate interest to Commission II.2 were as follows:

- (a) The order of precedence of elements as given by Table IV of the 'Red Book' and used for organic replacement nomenclature (already codified by Table 1 in Section B, but left incomplete by Rule B.1.4 and re-emphasized by Section D) was approved for choice of a parent ring system in naming fused ring systems and for choosing between hetero chains and rings. Carbon will assume its normal place in this order. Preference is given starting with the upper right of the Table. This leaves the sequence in Rule 2.161 as the only major order still not in agreement with Table IV.
- (b) Radical names will not be a part of Section G.
- (c) Extensions of the λ system were approved pending full documentation.
- (d) CNOC proposes to discontinue multiplicative nomenclature and discourage conjunctive nomenclature.
- (e) A formal oxo- group and at least one hydroxyl group are necessary to recognize an acid suffix in substitutive nomenclature.
- (f) The introduction to Section H (Isotopically Modified Compounds) will be expanded to explain why the extended Boughton system was not codified. CNOC decided that the atomic symbols D and T are to be discouraged. A section dealing with isotopically deficient compounds is to be added.
- (g) CNOC sees no grounds for special consideration to be paid to sulfur or polyfluoro- compounds since these can probably be dealt with by the extended λ system.
- (h) Dr. POWELL has received a positive response to a request for the identification of problems in the cryptate field and will be holding further meetings with Profs. LEHN and BUSCH.

Reports on Current Projects

10. Prof. FERNELIUS presented his document on 'Isotopically Modified Compounds'. After a brief discussion the Commission made several recommendations and Members were asked to send their

comments on the document to Prof. FERNELIUS. A final manuscript will be submitted by him to the President of Inorganic Chemistry Division.

11. Prof. BONNETT's 'Tetrapyrrole' document was considered in detail and approved subject to some reservations. The Chairman was asked to investigate the structure of the proposed Joint Commission on Biochemical Nomenclature (JCBN) with a view of gaining representation from inorganic chemists.

12. Dr. POWELL outlined the current work of the subcommittee on 'Ions, Radical-ions and Radicals'. He explained the systematic basis for naming cations, anions and radical substituent prefixes derived from skeletal systems by gain or loss of hydrogen atoms or ions. A table giving the recommended prefixes and suffixes together with examples illustrating the proposed system was presented. The Commission was very interested in the structure based systematic substitutive nomenclature developed for Section G and Prof. CHATT was asked to write to Prof. LOZAC'H requesting a draft of this document. The Chairman was asked to write to Prof. RIGAUDY requesting that Prof. FERNELIUS be appointed a member of this joint working party.

13. The Commission has not yet received a copy of the American Chemical Society Polymer Division's report on the 'Nomenclature of Inorganic Polymers'. Prof. FERNELIUS noted that progress on this document had been slow and thought that the Commission could initiate some valuable work in this area, perhaps through a working party. Dr. POWELL volunteered to produce a draft document on this subject in time for next year's meeting.

14. Prof. CHATT introduced the third draft of his document on the 'Nomenclature of Hydrides of Nitrogen and Derived Cations, Anions and Ligands'. The Commission had shown a preference for Version A of the third draft and therefore the discussion was limited to this document. Written comments received from Prof. K. A. JENSEN and Dr. W. H. POWELL were considered and several amendments were agreed to by the Commission. Prof. CHATT undertook to incorporate these amendments in a revised draft which will be sent to members in the autumn for comment. If these are of a trivial nature the document will be forwarded to the President of the Division for processing.

15. Dr. LEIGH introduced his document on 'Designation of Coordination Sites in Complex Ligands'. He made three general points: (a) The document tried to name all organic ligands as radicals

because it is occasionally impossible to name them any other way, and because many names, e.g. cyclopentadienyl are radical names in any case. (b) An attempt had been made to extend the *kappa* system so as to eliminate the need for η and μ thus by-passing confusion which has arisen from their mis-use. (c) It was proposed to discontinue the use of an oxidation state designator in the names of the complexes.

The Commission felt strongly that it wished to continue the present practice of naming ligands as anions. Dr POWELL stated that *Chemical Abstracts* has approved the publication of a document on the concept of *kappa* for single atom attachments in coordination nomenclature. After some discussion it was agreed that Prof. BERTELLO and Drs. LEIGH and POWELL should prepare a comparative document illustrating both the restricted and the general use of a *kappa* type notation for circulation at an early date.

16. The Secretary introduced his document on 'Nomenclature Scheme for Idealised Triangulated Polyhedra'. He summarized the position which had been reached at Santiago where both symbolic representations and unsystematic names had been presented, e.g. D^9_{3h} and tricapped trigonal prism. At that meeting the Commission had directed the Secretary to attempt to find systematic names for these polyhedra. On the basis of the mathematical ideas developed in his paper he found that convex polyhedra could be unambiguously named. The names suggested consisted of three components—the symbol Δ to indicate the presence of triangular faces; a name denoting the number of faces; and a statement of the kind of vertices present in the polyhedron. For example, the regular Platonic octahedron would be described as Δ -octahedron (6V₄) according to this scheme.

Dr. MINGOS accepted Dr. ADAMS' point that for more complex triangulated polyhedra the system would not distinguish between isomeric possibilities. He also noted that the system contained a certain duplication of names, e.g. octahedron for the Platonic solid and the bicapped tetrahedron, but the notation introduced to indicate the types of vertices present clearly distinguished the polyhedra. This point was accepted by the Commission.

The Chairman thanked the Secretary for his valuable contribution and suggested that attempts be made to extend the system to convex polyhedra. Dr. POWELL thought that if certain elements of the Schönflies symmetry symbol for the polyhedron were included in the name then it might help the chemist reconstruct the polyhedron from the name.

Dr. MINGOS was instructed to attempt to develop the system

further bearing the following points in mind: (a) The general system will need to encompass *nido*- and capped polyhedra. (b) The isomeric possibilities generated by capped polyhedra need to be thoroughly investigated.

The Commission decided that the names used in the document should be retained at least for the time being, although it may be desirable to compress the name to a simpler symbol, e.g. Δ_8 , in the final document.

17. Dr. POWELL introduced his paper on 'Numbering of Closed Triangulated Polyhedral Skeletons'. The scheme had been developed from the boron rules and the rules for coordination compounds as described in 7.514 of the 'Red Book'. In the discussion which followed the Commission decided that it was most important to consider the development of a general rule for cluster nomenclature and that nomenclature of boron compounds would represent only a specific example of the application of these rules. The Commission strongly approved the document and suggested the following minor modifications: (a) A preamble be added to the rules making it perfectly clear that the numbering schemes generated apply to idealized skeletal structures and do not refer to substituted derivatives. (b) The Commission found parts of the documents, especially 2b and 4b, difficult to comprehend and recommended careful redrafting of these sections. (c) It was decided that the system should be extended to include concave polyhedra.

Dr. POWELL noted that although the numbering system suggested could be applied to fused systems it caused certain difficulties and that in such cases it might be desirable to number the constituent polyhedra separately. The Commission thought that the development of a general numbering system applicable to all clusters should not be pre-empted by prior development of the boron rules.

18. The Commission wholeheartedly agreed with Dr. BUSCHBECK that the 'Proliferation of Non-systematic Abbreviations' was very undesirable. The Commission, however, felt somewhat limited in the kind of action it could take. After considerable discussion the chairman was instructed to write to the English editors of the new European Synopsis journal expressing the Commission's views and encouraging them to take a firmer line on abbreviations. Drs. JEANNIN and BUSCHBECK would write similarly to the French and German editors and Dr. POWELL and Prof. FERNELIUS to American Chemical Society editors. The Commission agreed to consider the matter of abbreviations further during the revision of the 'Red Book'. The

Commission noted with displeasure the apparently flippant attitude of the editorial staff of *Journal of American Chemical Society* concerning nomenclature and in particular the paper by A. GILBERT and R. WALSH published in it [98 (1976) p. 1607]. Dr. POWELL undertook to bring this paper to the attention of CNOC.

19. Dr. LEIGH introduced his document on the 'Use of -io endings in Coordination Nomenclature' which had been prepared at the request of CNOC. In reviewing his document he made the following points: (a) the -io radical formalism was particularly useful for describing radicals which cannot be derived from reasonable oxyacid or hydride parents. (b) The -io radical names could be used in coordination and substitutive nomenclature schemes. (c) In organometallic compounds containing multiple bonds the -io radicals names do not always give unambiguously the necessary structural information. (d) In compounds containing several metal atoms the use of Table IV did not always lead to chemically reasonable assignments to the central metal and ligand fragments.

In the discussion which followed the Commission decided that the use of -io radical names should be limited to those compounds which could not be adequately described at present by the rules given in the 'Red Book'. In substitutive nomenclature the Commission agreed that it may be necessary to add an additional designator to the -io radical name to indicate the multiplicity of the bond attachments it makes. The Commission recognized that in many of the compounds discussed the assignment of formal oxidation states could be confusing to chemists and agreed to limit the use of Stock numbers to simple coordination compounds. Dr. LEIGH was instructed to prepare a shortened version of his document which would take into account the decisions described above.

Working Parties on Specific Projects

20. The following working parties were set up by the Commission:

- (i) Designation of Coordinating Sites in Ligands
G. J. LEIGH,* J. R. DILWORTH and W. H. POWELL
- (ii) Extension of Coordination Nomenclature to Non-metallic Compounds
Y. JEANNIN,* L. F. BERTELLO, K. A. JENSEN and B. MYASOEDOV

- (iii) Nomenclature of Cluster Compounds (triangulated polyhedra and close polyhedral skeletons)
D. M. P. MINGOS,* R. M. ADAMS, K. C. H. BUSCHBECK,
W. C. FERNELIUS and W. H. POWELL
- (iv) Boron Nomenclature
W. H. POWELL,* R. M. ADAMS, K. C. H. BUSCHBECK
and W. C. FERNELIUS (Dr. S. SHORE† and Dr. K.
NIEDENZU†)
- (v) Ring and Chain Nomenclature
K. C. H. BUSCHBECK,* A. COWLEY,† E. FLUCK,
GERWARTH,† K. A. JENSEN and D. M. P. MINGOS
- (vi) Three-dimensional Heteropolyacid Nomenclature
Y. JEANNIN*
- (vii) 'io' Nomenclature
G. J. LEIGH,* L. F. BERTELLO, J. CHATT and B.
MYASOEDOV
- (viii) Nomenclature of Coordination Stereoisomers
W. H. POWELL,* D. BUSCH,† E. SARGESON,† K.
SCHAFFER, T. SLOAN† and K. YAMASAKI
- (ix) Nomenclature of Inorganic Polymers
W. H. POWELL

21. The Secretary was instructed to write to Prof. ADAMS to inquire whether he wished to continue as a Member of the working party on 'Ring and Chain Nomenclature'.

22. The Inorganic Commission agreed that the 'Nomenclature of Inorganic Sulfur Compounds' could be adequately dealt with by the working parties on the 'Extension of Coordination Nomenclature to Non-Metallic Compounds' and 'Ring and Chain Nomenclature'. The Secretary was asked to write to Prof. JENSEN inviting him to join these working parties. The Chairman was instructed to write to Prof. LOZAC'H concurring in the abolition of the joint working party on sulfur compounds.

23. The working parties listed above held short meetings at the Paris meeting and agreed on the following programmes of work for the coming year:

*Convenor.

†The convenors have been requested to write to these experts inviting them to take part in the working parties. Copies of their letters should be sent to the secretary of the Commission.

- (i) *Designation of Coordination Sites in Ligands.* Draughtsmen at Chemical Abstracts Service will prepare drawings of some of the examples given in Dr. LEIGH's document and Dr. POWELL will name these compounds according to the η , κ notation suggested by *Chemical Abstracts*. He will send these named examples to Dr. LEIGH by the end of October, who will add his alternative names. Dr. DILWORTH will provide some compound names in order to test whether the structures may be reconstructed from the names. The first draft of the document will be sent to Commission Members by mid-November, and comments expected by mid-March. These comments will be incorporated by Dr. LEIGH into a final draft for next years' meeting of the Commission.
- (ii) *Extension of Coordination Nomenclature to Non-metallic Compounds.* This working party will investigate the extension of co-ordination nomenclature to main group elements, ring and chain compounds. The problems arising from oxidation state formalisms will also be considered. Prof. JEANNIN will prepare a document for circulation to Commission Members by December.
- (iii) *Nomenclature of Cluster Compounds (triangulated polyhedra and closed polyhedral skeletons).* This working party will concentrate its efforts on producing documents on general polyhedral skeletons. Dr. MINGOS will send his document to mathematicians for comments on the theoretical basis of the numbering scheme. He will incorporate their comments in a revised document, which will include a discussion of *nido*- and *capped* polyhedra. This document will be ready for distribution by December. Dr. POWELL and Prof. FERNELIUS will redraft the document on numbering in closed polyhedra, making it more suitable for the general reader. When comments have been received on both documents a combined document will be drafted for distribution to the whole Commission in May.
- (iv) *Boron Nomenclature.* The major aim of this working party is to prepare a revision of the boron nomenclature document, which will be agreeable to this Commission, *Chemical Abstracts* and *Gmelin*. Organo-boron ring compounds and simply binary compounds will not be included in this document. Prof. FERNELIUS and Dr. POWELL will review the most recent

Gmelin document, and at the same time Dr. BUSCHBECK will review the documents prepared by Dr. POWELL and Prof. ADAMS for the Slaugham meeting. When comments have been exchanged Prof. FERNELIUS and Dr. POWELL will distribute a preliminary draft of the revised document to the working party. The final draft of the document will be distributed to the Commission in time for next year's meeting.

- (v) *Ring and Chain Nomenclature.* This working party will review the documents prepared for the Commission in recent years and will then produce some positive recommendations concerning the definition of the chain, and the type of nomenclature system most suitable for dealing with the problem, i.e. substitutive or coordination. The examples provided by Dr. POWELL will be used to test these recommendations.
- (vi) *Three-Dimensional Heteropolyacid Nomenclature.* Prof. JEANNIN stated that he has prepared a document on this topic and will be sending it to experts in the field. The Commission will co-opt outside members to this working party at next year's meeting if it is established that some progress is being made in this difficult area.
- (vii) *'io' Nomenclature.* This working party agreed to write a document defining the derivation of -io names, and their use in coordination nomenclature. The extension of -io nomenclature principles to chain compounds, including those with non-metallic atoms and organic substitutive nomenclature will be explored. Dr. LEIGH will prepare a document for consideration by the working party by early January 1977. Replies from the working party will be incorporated in a revised manuscript after 1 March. This document will be distributed to the whole Commission in June.
- (viii) *Nomenclature of Coordination Stereoisomers.* The initial goal of this working party is to define the present use of stereochemical descriptors in mononuclear coordination compounds. This work will rely heavily on the analysis of *Chemical Abstracts* system for dealing with stereochemical designators being undertaken by Prof. BUSCH and Mr. SLOAN.
- (ix) *Nomenclature of Inorganic Polymers.* Dr. POWELL will produce a document on Inorganic Polymers for next year's meeting.

Joint Working Party on Macrocyclic Ligands

24. Dr. POWELL reported on the activities of the joint working party on 'Macrocyclic Ligands'. He has consulted with experts in the field and hopes to prepare a draft document summarizing present nomenclature practices by next Spring. This document will also propose more acceptable abbreviations for these ligands and their complexes and will incorporate Prof. LEHN's system of Group Theoretical symbols for inclusion compounds.

Non-Stoichiometric Compounds

25. Prof. JEANNIN noted that he had received several complaints about the chapter in the 'Red Book' dealing with non-stoichiometric compounds. He was requested to collate documents on the nomenclature systems pertaining to these compounds. It was suggested that Prof. N. N. GREENWOOD might be able to advise him on the relative merits of these systems. Prof. JEANNIN will report at next year's meeting.

Date and Place of Next Meeting

26. The Chairman announced that the next meeting of the Commission will be held between the 9 and 14 August 1977. The Meeting will probably be held in Prague or Warsaw. The Commission was concerned that if it continued to hold its meetings away from the General Assembly of IUPAC the members would forfeit their voting rights in the Inorganic Chemistry Division. The Chairman was instructed to write to the Executive Secretary of IUPAC to inquire about the possibility of a postal ballot in these circumstances. The Commission Members felt that even if they lost their voting rights they would in general prefer to meet away from the General Assembly.

D. M. P. MINGOS

JOINT SUBCOMMITTEE OF COMMISSIONS ON ELECTROCHEMISTRY (I.3) and ELECTROANALYTICAL CHEMISTRY (V.5)

Paris, 1-2 July 1976

Present: Chairman, Secretary and one additional Member of each Commission: Prof. N. IBL, Dr. J.-C. JUSTICE and Dr. R. PARSONS

(Commission I.3), and Prof. R. G. BATES, Prof. J. F. COETZEE, and Prof. H. W. NÜRNBERG (Commission V.5). Also present as Observers: Dr. J. EPELBOIN and M. M. FROMENT (Commission I.3).

1. Terms, Symbols and Definitions for Electroanalytical Chemistry

A preliminary discussion of this report, prepared by Profs. MEITES, NÜRNBERG, ZUMAN and BISHOP, had taken place at a joint meeting of Commissions I.3 and V.5 in Madrid (September 1975), when more detailed written comments by Members of Commission I.3 and other interested people had been solicited. Subsequently, comments had been received from Profs. K. E. HEUSLER, N. IBL, R. TAMAMUSHI, S. TRASATTI and Drs. J. KUTA, R. PARSONS, K. NIKI and others. These comments were discussed in detail at the meeting and a number of changes were made in the report. In addition, certain other proposed changes would be discussed with Profs. MEITES, ZUMAN and BISHOP. A particularly thorough discussion concerned the exact meaning of the term 'diffusion control', which is of central significance in the report. Reference would be made to previous reports, particularly 'Electrochemical Nomenclature' [Appendix III to *Manual*], 'Classification and Nomenclature of Electroanalytical Techniques' [*Pure Appl. Chem.*, Vol. 45, No. 2 (1976), pp. 81-97] and 'Recommendations for Sign Conventions and Plotting of Electrochemical Data' [*Pure Appl. Chem.*, Vol. 45, No. 2 (1976), pp. 131-134]. The symbol for 'kinetic current' should be I_k or i_k , not I_{cin} or i_{cin} . In those cases where confusion may arise, definitions should be clarified with suitable examples or illustrations. It will be desirable to specify exactly what is meant by 'Negligible', particularly whether the limitation is instrumental or theoretical, e.g. truncation of a series expansion.

2. Other Reports

Drafts of the following reports were also discussed, but in less detail: (i) Standard Potential of the Silver-Silver Chloride Electrode (BATES); (ii) Electrode Reaction Orders, Transfer Coefficients and Rate Constants (PARSONS); (iii) Section 9 of Terminology and Symbols for Mass Transport Phenomena in Electrochemical Systems (IBL); (iv) An Approach to a Systematic Reanalysis of Conductance Data (JUSTICE).

3. Joint Projects

The expected thrust of projects of Commissions I.3 and V.5 initiated at Madrid was discussed. It was agreed that Commission I.3 project on standardization of the pH scale may well be extended to other ions and become a joint project of Commissions I.3 and V.5. In future, all reports and other documents of common interest will be sent to all Members of both Commissions.

4. Publications Policy

Strong and general dissatisfaction was expressed with publication procedures of IUPAC. *Pure and Applied Chemistry* is not widely read, and in certain cases other journals would be more appropriate. The Secretariat will be asked how to get permission to publish elsewhere, and at what stage in the procedure. The question of translations of reports will also be raised. The Secretariat will be requested to send reprints of reports to all Members of both Commissions and also to all people who commented on provisional reports. Finally, it was the strong consensus that the names of authors should appear on all reports, not only for reasons of due credit, but also to facilitate subsequent correspondence concerning reports.

J. F. COETZEE

COMMISSION ON RECLAMATION OF SOLID WASTES

Berlin, 3 July 1976

1. The Chairman, Prof. S. J. PIRT, described some of the work of the members of the Commission and how the decision to expand the membership from 3 to 8 had arisen. It was agreed that all the members of the enlarged Commission would present papers at the IUPAC Conference in Warsaw in 1977. The present meeting had been convened to work out the details of the Warsaw meeting.

2. It was agreed that the existing members would cover the following topics:

S. J. PIRT	Aerobic and anaerobic microbial digestion
A. HUMPHREY	High and low temperature pyrolysis with special reference to cellulose plastics and rubber.
R. C. POLLER	Pollution, health and toxicological aspects.

The following are to be asked to join the Commission and to present papers on the topics indicated.

T. K. GHOSE (India)	Enzymatic breakdown of cellulosic wastes.
L. G. LINDFORS (Sweden)	Domestic and commercial refuse—presorting, collection and pulverizing.
K. YAMADA (Japan)	Composting.
A. W. FLETCHER (UK)	Metal wastes.
L. A. DMITRIENKO (USSR)	Chemical breakdown of cellulose and lignin.

3. The Secretary pointed out that Prof. DMITRIENKO had not replied to a letter sent on 26 March. Prof. HUMPHREY was leaving for USSR the next day and said he would see Prof. DMITRIENKO and ask him to join the Commission. If this approach was unsuccessful, Dr. HUMPHREY would send to the Secretary the names of two other suitable people (one Swedish and the other American) and one of these would be invited to join the Commission in place of Prof. DMITRIENKO.

4. It was agreed that there should be two additional speakers at the Warsaw meeting of the Commission—Dr. I. ZANDI on 'A World Overview' and Dr. C. ROLZ on 'Particular Problems of Developing Countries'. It was thought that it would be unnecessary for these two speakers to become Titular Members of the Commission as they would already be receiving funds to attend the Warsaw Meeting. Dr. HUMPHREY agreed to make informal approaches to Dr. ZANDI and Dr. ROLZ and to report back.

5. The speakers would be asked to submit an abstract (not more than 500 words) of their papers to the secretary by 15 April 1977. A copy of each abstract will be sent to all participants. The papers should consist of 20 pages, including tables but not figures, of double-spaced A4 (8.3 × 11.7 in.) typescript. It will be emphasized to the new members of the Commission that reimbursement of their expenses for

attending the Warsaw Conference will be made on receipt of a satisfactory typescript of their presentation. All typescripts should be sent to the Secretary by 15 June 1977.

6. At the Warsaw meeting 5 papers will be presented on 22 August (45 min allotted to each paper, followed by 15 min for discussion), the remaining 5 papers to be presented on 23 August. On 24 August the morning will be devoted to general discussions and summarizing sessions; and in the afternoon and on 25 August the participants will be invited to make revisions of their talks in the light of the general discussions. There will be a final meeting on 26 August to agree to the details of the final written report and for drawing general conclusions.

7. As it was unlikely that the Commission would be able to meet before the Warsaw Conference it was agreed that since the Secretary and Dr. HUMPHREY were both attending the fall ACS meeting in San Francisco they would meet to discuss progress.

R. C. POLLER

MACROMOLECULAR DIVISION COMMITTEE (MMD)

Paris, 3 July 1976

Present: Prof. C. G. OVERBERGER (President), Prof. H. BENOÎT (Past-President), Prof. V. A. KABANOV (Vice-President), Dr. A. J. de VRIES (Secretary), Prof. C. H. BAMFORD, Prof. P. CORRADINI, Prof. A. NAKAJIMA, Prof. R. C. SCHULZ, Prof. F. TÜDÖS (Titular Members); Dr. J. W. BARRETT, Mr. P. H. FINK-JENSEN, Dr. D. HEINZE, Dr. J. H. SAUNDERS (Coopted Members); Prof. P. H. TEYSSIE, Prof. J. KALAL, Prof. B. PHILIPP, Prof. B. RÅNBY (National Representatives).

1. Minutes of Previous Meeting

The minutes of the previous meeting held in Madrid on 2 and 6 September 1975 [see *Comptes Rendus 28th Conference: Part B*, pp. 234-238] were approved.

2. Sponsorship of Symposia/Microsymposia

1976

- A successful microsymposium on Photochemical Processes in Polymer Chemistry, organized by Prof. G. SMETS, had been held in Leuven, Belgium, 2–4 June.
- The Second International Symposium on Polyvinylchloride, organized by Dr. A. GUYOT in Lyon-Villeurbanne, France, 5–9 July, had registered about 350 attendees from more than 30 different countries. Unfortunately, the delegation from the USSR, including one invited main lecturer, cancelled its participation at the last moment. A special panel discussion on the toxicological problems associated with the vinyl chloride monomer was held as part of the symposium.
- The 16th Prague Microsymposium 'Advances in Scattering Methods', and the 5th Discussion Conference 'Phases and Interfaces in Polymer Systems', to be held simultaneously in Prague, 12–16 July, were organized by Dr. SEDLÁČEK and Dr. POUCHLY, respectively. This was the first time that two meetings on macromolecules were to be held in Prague simultaneously and this innovation had to be considered as an experiment, according to the organizers.
- The Symposium on Long-Term Properties of Polymers and Polymeric Materials, to be held in Stockholm, Sweden, 30 August–1 September, organized by Prof. RÅNBY, was to be attended by more than 200 participants from all over the world; more than 100 papers were to be presented.

1977

- 26th IUPAC Congress, Tokyo, Japan, 4–10 September. Within this Congress, a Macromolecular Symposium is to be held with a limited number of main topics. Further detailed information on the program would become available shortly.
- International Symposium on Macromolecules—MACRO DUBLIN, is to be held in Dublin, Ireland, 17–22 July, organized by Prof. PEPPER. The four main topics of this symposium had been chosen to avoid overlapping with those proposed for the Macromolecular Section of the 26th IUPAC-Congress in Tokyo.
- 17th Prague Microsymposium on 'Chemical Problems of Medical Polymers', is to be held in Prague, August 1977. The Committee

agreed to recommend IUPAC sponsorship of this meeting if its date was chosen in such a way that no overlapping with the IUPAC General Assembly in Warsaw would occur.

1978

- 25th IUPAC International Symposium on Macromolecules, Tashkent, USSR, 10–14 October. Prof. KABANOV announced that the first circular concerning this symposium would appear in September 1976. The Academy of Sciences of the USSR, intended to invite 30 main and plenary lecturers, but no travel expenses outside the USSR would be taken care of. The scientific programme would be subdivided into seven sections.
- A Microsymposium on Polymer Dispersions, to be held in Dresden (GDR) and organized by Prof. PHILIPP, originally planned for 1977, was now proposed to take place in May 1978, in order to avoid overlap with other meetings and to allow for sufficient preparation time. Accommodation for about 250 attendees was available in Dresden.
- Two Prague microsymposia were planned for the summer of 1978:
 - (i) Polymer Structure and Dynamics—A Molecular Spectroscopist's View
 - (ii) Synthetic and Semi-synthetic Macromolecular Catalysts

With regard to the first topic, Prof. BENOÎT would inquire about the possible interference with a planned Europhysics Conference on a similar theme; such interference or overlap should be avoided.

1979

- 26th IUPAC International Symposium on Macromolecules, Mainz (FRG), 17–21 September. On behalf of the organizing committee, Prof. SCHULZ expressed his hope that no other important international meetings in the field of macromolecular chemistry would take place in the same period. Since, in principle, the 27th IUPAC Congress should also be held in 1979, the MMD Committee was not favourable to granting IUPAC sponsorship to other macromolecular symposia planned for 1979, but the Committee would favourably consider IUPAC sponsorship of a Symposium on Stereospecific Polymerization, celebrating the 25th anniversary of the first scientific publication on isotactic polypropylene, to be organized by the University of Pisa, and to be held in Vlarreggio (Italy) in 1980 instead of 1979.

3. Guidelines for Sponsorship of Symposia

In view of recent experience (in particular concerning the IUPAC-sponsored International Symposium on PVC in Lyon) the MMD emphasized the need to urge all members of national IUPAC bodies, concerned with clearance of papers submitted for presentation at IUPAC-sponsored symposia, to carefully consider the serious problems and damage which may result from unnecessary and untimely withdrawal of planned contributions and to ask for the taking of necessary steps in order to minimize occurrence of such events.

4. Commission on Macromolecular Nomenclature (IV.1)

Prof. CORRADINI reported on the activities of Commission IV.1 [Minutes of the meeting of IV.1 held in Dorking during 7-11 June 1976 have been published in IUPAC *Information Bulletin*, Nos. 52/53 (May 1977), pp. 54-57]. In order to prepare future replacements, members of the MMD Committee were asked to propose possible candidates for associate membership of this Commission.

5. Commission on Polymer Characterization and Properties (IV.2)

Dr. BARRETT reported on the first meeting of the Commission, held in Antony (France) on 2 July 1976. [Minutes of this meeting have been published in IUPAC *Information Bulletin*, Nos. 52/53 (May 1977), pp. 64-70]. Dr. BARRETT explained that essentially, the Commission is charged with: (a) Coordination of activities of present Working Parties. (b) Creation and control of new Working Parties covering specific topics in the general field of characterization and properties of industrially important polymers.

Present Working Parties are concerned with: (i) Molecular characterization (Chairman to be nominated), (ii) Structure and properties (Chairman: Dr. P. L. CLEGG), (iii) Supported polymer films, (Chairman: Mr. P. H. FINK-JENSEN), (iv) Thermodynamic properties (Chairman: Dr. H. WILSKI).

Summary reports of the present and projected activities of the four Working Parties had been made available to the Commission, and were extensively discussed. The Commission agreed on the following recommendations to the MMD Committee:

- (i) Dr. Th. G. SCHOLTE (Dutch State Mines) to be nominated Chairman of the Working Party on Molecular Characterization of Commercial Polymers.
- (ii) Calibration methods and suggestions for proper molecular characterization by GPC, light scattering, etc., developed by the Working Party on Molecular Characterization of Commercial Polymers, to be summarized and passed to ISO in view of international standardization. Other Working Parties to consider possibilities for similar actions.
- (iii) Collaborative studies on elastomers to be encouraged, but without creation of a separate Working Party on elastomers or any other particular sector of macromolecules.
- (iv) The operations of the 'network club' appearing not to fit into the framework of Working Parties, it is recommended that any IUPAC sponsorship should be found through some other means, e.g. micro-conferences.
- (v) Four areas for possible new Working Parties to be considered are:
 - (a) Combustion properties.
 - (b) Translocation of low molecular weight species in macromolecular systems.
 - (c) Surface properties of films and fibers.
 - (d) Thermal conductivity of polymers.

The Division Committee was invited to comment on and to make suggestions for suitable participants in any or all of the above topics. All recommendations were approved by the Division Committee and the following actions were decided upon:

- (i) Nomination of Dr. SCHOLTE (Prof. OVERBERGER)
- (ii) Preparation of recommendation to ISO (Prof. BENOÎT)
- (iii) Preparation of written comments on, and suggestions for, new Working Parties (all members of the Committee). These comments should be sent to the Secretary, if possible before the end of 1976, but in any case before the next meeting. It was agreed that new areas should be explored carefully and should not be undertaken until further progress and evaluation of existing Working Parties was made.

It was further agreed on that the MMD should endorse the concept of group activities as exemplified by the 'network club' and encourage this type of useful activities (exchange of information, organization of open meetings, etc.).

A detailed account of the present programmes of the Working

Parties and of the conclusions reached at the meeting of Commission IV.2 were to be published in the minutes of that meeting, but Dr. BARRETT mentioned, in particular, the conclusions of the Commission concerning the Working Party on Supported Polymer Films; the present membership of this Working Party was considered not sufficiently representative of industry for programmes such as those proposed for: (i) Analysis of functional groups in amino resins. (ii) Solvent-polymer interaction studies. (iii) Measurement of adhesion.

The Commission, therefore, endorsed the proposed circularization, throughout the Division, of the proposals for the first two projects, but emphasized the need for these to be drawn up in specific terms. The latter recommendation of Commission IV.2 was fully approved by the Division Committee.

Finally, the Commission agreed to the need for proper information before commencement of any collaborative IUPAC programmes and, hence suggested that the two information projects of this Working Party continue. The Division Committee endorsed this suggestion as to the first project (information on documentation centres) asking for a rapid finalization, but desired to have an assessment of the feasibility of the second project (information concerning on-going research projects throughout the world).

It was decided to take a vote on the further continuation of the Working Parties at the next meeting in Warsaw. Dr. BARRETT emphasized the need for a Secretary of Commission IV.2, presently comprised of five titular members and two ex-officio members. The Committee agreed to take necessary steps in due time and decided to ask the Bureau for an increase in membership, if and when additional Working Parties were to be created.

6. Possible New Activities of the MMD

Prof. RÅNBY drew attention to the ever-existing problems related to insufficient training in polymer science in many universities, in particular with regard to the needs of polymer industry. After some discussion on possible actions of the MMD in this field, it was decided to invite Prof. BAMFORD to make contact with Prof. SHELDON of the University of Bradford, UK, who has gathered detailed information on the subject. It would be interesting to know whether Prof. SHELDON might be willing to edit a report on this question, including the industry's point of view. Suitable further actions should be

considered in a later stage, e.g. collaboration with the IUPAC Committee on Teaching of Chemistry.

The members of the Committee agreed that more involvement of the Division might be desirable with regard to problems concerning biopolymers, natural and semi-synthetic macromolecules, as well as to problems of biodegradation of macromolecules. It was pointed out that overlap with IUPAB activities should be avoided, but the possible joint sponsorship with IUPAB of a future symposium on biopolymers would be worthy of future consideration.

7. Statutes and Bylaws for the Macromolecular Division

It was agreed that the Secretary would make a compilation of all relevant decisions reported in the Minutes of the Committee Meetings since 1967. A subcommittee under the chairmanship of Prof. BENOÎT would proceed then, on the basis of this information, to prepare an appropriate draft project.

8. Macromolecular Division News Bulletin

The Secretary was invited to edit once a year a short *News Bulletin* (at most, one page typed) for distribution to the editors of national polymer journals or other regular publications. Profs. BAMFORD, SCHULZ, and TEYSSIE expressed their willingness to take charge of the publication in their respective countries. The *News Bulletin* would be essentially based on the Minutes of the Division Committee Meetings, and its distribution would proceed through the Oxford Secretariat.

9. Date and Place of Next Meeting

The next meeting of the Macromolecular Division Committee would be held during the 29th IUPAC General Assembly in Warsaw and was scheduled for 12 and 17 August 1977.

C. G. OVERBERGER

**COORDINATING COMMITTEE ON ANALYTICAL
METHODS FOR CEE AND IARC:
LIAISON GROUP**

London, 23 July 1976

Present: Prof. R. TRUHAUT (Chairman), Prof. F. PELLERIN (Secretary), Prof. R. BELCHER, Dr. H. EGAN, Dr. P. SCHULLER.

**1. Chairman's Report and General Discussion of CEE
Contract**

Prof. TRUHAUT recalled the difficulties encountered with finalization of the 1974 Contract, as well as the financial and administrative difficulties in connection with getting a new contract. He also recalled that last year he had accompanied the then President of IUPAC, Sir HAROLD THOMPSON, to Brussels for discussions with the CEE authorities. It was decided at that time to prepare 5 analytical methods left from the 1974 Contract. The sum of 8500 Swiss francs had been set aside for these 5 methods. On several occasions Prof. TRUHAUT met Mr. BARTHELEMY (Assistant Director of Agriculture at the CEE), and it was planned to prepare a new contract for 10 analytical methods. The Chairman regretted that within the framework of the policy previously laid down, and up till that point adhered to, it had not been possible to submit the plan before to the President of IUPAC.

Prof. TRUHAUT reported that the standard procedure had not been followed—because of a misunderstanding and a mistake on the part of the CEE, the Draft Agreement was sent directly to the IUPAC President by way of the Secretariat in Oxford, before Prof. TRUHAUT had given his opinion. This resulted in a delay in the dispatch of the contract and some confusion which was clarified when Profs. TRUHAUT and PELLERIN recently received copies of the Draft Agreement. The Agreement was presented to the Members of the Liaison Group. Prof. TRUHAUT indicated that a total sum of 20,000 Swiss francs had been allocated. This sum includes:

- 8500 Swiss francs envisaged for the 5 methods; a sixth method was added after a request from the CEE.
- 11,500 Swiss francs for 10 methods to be revised.

During the talks, Prof. BELCHER emphasized the necessity to hold a meeting between the IUPAC and CEE experts; he asked Prof.

TRUHAUT to write to the IUPAC President and invite him to send a request for such a meeting to the CEE. Prof. TRUHAUT will present this problem at the forthcoming Bureau meeting in Strasbourg.

2. Finalization of Six Methods

Prof. PELLERIN informed that 5 methods had been circulated (29 January 1976) amongst Members of the Coordinating Committee on Food Chemistry and Commission on Analytical Reactions and Reagents (V.1). Also, Commission V.1 had examined these methods at its meeting in Paris on 8 May 1976. Prof. PELLERIN presented the report subsequently sent to Members of the Coordinating Committee (17 June 1976). The Liaison Group examined this report as well as the comments which had been submitted.

Method 76-1: Determination of SO₃ in SO₂ (modified June 1976)

Method 76-4: Limit on Non-volatile Matter in SO₂ (modified June 1976)

Following suggestions made by Dr. HAENNI, Prof. PELLERIN proposed adoption of the methods described in the US Pharmacopeia 19 for these two determinations. Prof. BELCHER remarked that the oxidation of SO₂ by air could interfere with the result. Dr. SCHULLER stressed that there is a contradiction between the norms presented for these two methods. Under these circumstances, the Group accepted Prof. BELCHER's proposition:

Meca Spectroscopy constitutes a reference method which, with the present state of standardization current in laboratories cannot be envisaged as a routine method. Prof. BELCHER said that a simpler routine method carried out in the presence of EDTA as an inhibitor of oxidative metallic catalysts allows a turbidimetric determination. This method is used in his laboratory; he will send the text to Prof. PELLERIN for circulation.

Methods 76-2 and 76-3: Determination of Organically-bound Chlorine in Benzoic Acid and Benzoates of Sodium, Potassium and Calcium (E. 210-231) (modified June 1976)

The Liaison Group thought that it is very important to draw the attention of the CEE to the fact that the existing norms are not realistic either from a chemical or toxicological point of view. In fact, the industrial synthesis of benzoic acid is now based on toluene and

not, as formerly, on benzyl chloride. Research on chlorine derivatives is no longer justified under the same conditions. On the other hand, it seems that such a method implies two determinations: (i) determination of chlorides; (ii) determination of total chlorine after mineralization.

Under these conditions, the Liaison Group decided: (i) To draw the CEE's attention to this fact; when the methods are sent to them, Prof. TRUHAUT will send an explanatory note on this matter. (ii) To send to the CEE two methods, stressing that putting them into a definitive form is subordinate for the opinion of the CEE concerning tolerable limits of chlorides and of total chlorine, which is still to be fixed by them, taking into consideration the remarks of the IUPAC experts on this subject.

Methods 76-5: Determination of 4-Hydroxyanisole in Butylhydroxyanisole (modified June 1976)

Method 76-6: Determination of Specific Absorption $E_{1\text{ cm}}^{1\%}$ in Ethanol (modified June 1976)

These two methods were accepted.

*Detection of 0.01% of α -Naphthol in *o*-Phenylphenol*

The CEE asked that method 2/74 'Detection of 0.01% of α -naphthol in sodium *o*-phenylphenate' be adapted to the case of *o*-phenylphenol. The adaption presents no problems; method 2/74 is directly applicable; the only difference lies in the means of dissolution. The detection of α -naphthol in *o*-phenylphenol had previously been circulated as 7/73 and adapted to the sodium derivative, which at that time was the only one requested by the CEE for testing.

It was decided that this method would be added to the methods for the 1976 contract to be sent at the latest by 31 October 1976.

3. 1976 Contract: Ten Methods

Prof. PELLERIN indicated that on the suggestion of Prof. TRUHAUT and at the request of the CEE he had met Mlle. DEMINE (from the Agriculture Department) on 13 May 1976 in Brussels. Mlle. DEMINE told him that a certain number of methods had been circulated amongst the CEE experts and had not given rise to any critical comments, or else had only prompted minor suggestions which did not necessitate an actual revision by IUPAC. Mlle. DEMINE and Prof. PELLERIN decided that 10 methods needed to be revised taking into account the remarks made by the CEE experts.

ADD. 76-1: Determination of Sulfated Ash

The CEE had asked that the previous method be presented in a simpler and more concise form. Prof. PELLERIN proposed that the method of the European Pharmacopea be put forward. This method will be circulated amongst the IUPAC experts in order that they can give their opinions on the two following points: (i) temperature of calcination of dark red (redness 600°); (ii) need to use ammonium carbonate.

ADD. 76-2 and 76-3: Determination of Melting Point and Boiling Point

The comments of the CEE experts show that the wording of the techniques is not clear; they think it preferable to choose the apparatus and the methods described in the 5th edition of the Swiss Pharmacopea (1933) and reprinted in the European Pharmacopea (Vol. 1, 1969). It was decided to have the text of the European Pharmacopea circulated amongst the IUPAC experts.

ADD. 76-4: Limit Test for Iodides in Erythrosin

The CEE experts had accepted method 7/72 RE.1; they asked for the result to be expressed as sodium iodide. It was suitable subject to modifying the composition of the standard solution.

A standard solution containing 0.1106 g of potassium iodide per 1000 ml would be used: 1 ml of this solution corresponds to 0.100 mg of sodium iodide. It was decided that it would be useless to circulate this method.

ADD. 75-5: Determination of Water-Insoluble Matter in Colorants Used in Foods (1/72 RE.1) and the Propionates of Sodium and Calcium (2-3/72 RE.1)

Certain CEE experts asked if it was possible to standardize the temperature of dessication to 100-105°. After a general discussion between Members of the Liaison Group it was decided to standardize the temperature of dessication to 105°. It was considered unnecessary to have this method circulated.

ADD. 76-6: Determination of Acid Value of Lecithin

The remarks on this method (1/70 RE.1) mentioned the difficulty of appreciating the end-point of determination by the use of phenolphthalein. Two points must be emphasized: (i) The lack of distinct

change of colour does not occur when the lecithin is strongly coloured; the titration can be carried out using a potentiometer. (ii) To change the indicator or solvents risks changing the norm, and would no longer correspond to the definition of the acid index. It was agreed that Prof. PELLERIN will seek the advice of Prof. PAQUOT. The method will be circulated amongst the IUPAC experts.

ADD. 76-7: Determination of Unsulfonated Primary Aromatic Amines in Water-Soluble colorants (19/68)

This method gave rise to much discussion, from which the following points arose: (i) The use of aniline as a standard is not recommended. Aniline must first be distilled and it is not stable in solution. (ii) It is preferable to use the chlorhydrate of α -naphthylamine (analytical grade). Its titration, can be achieved by determination of primary aromatic amine nitrogen; α -naphthylamine was recommended in the research on aromatic amines in diphenyl. Under the circumstances it was decided that there was no point in having this method circulated; it will be presented in the usual way by Dr. M. KAPEL.

ADD. 76-8: Method for Specific Determination of Benzidine of β -Naphthylamine and 4-Aminodiphenyl in Water-Soluble Colorants

This method (20/68) did not give rise to any particular remark in 1971 in Washington and has not been revised. The comments of the CEE experts concern only the wording of the mode of operation. After discussion, Dr. EGAN proposed to verify if there exists a more modern method, more specifically designed for this determination. He will send a text to Prof. PELLERIN.

ADD. 76-9: Determination of Isatin 5-Sulfonic Acid in Indigotin

The CEE requested clarification of certain technical details in this method. Two CEE experts recommend the use of sodium isatin 5-sulfonate instead of the potassium salt; the CEE directive rules that the strength be measured by the sodium salt. In fact, it seems that potassium isatin 5-sulfonate gives a better result than the sodium salt; for this reason the potassium salt is used as the sample, and the strength is expressed as the sodium salt. The method for preparation of the potassium salt (O.M.S. technique) will be added. It was considered unnecessary to have this method circulated.

ADD. 76-10: Limit Test for Oxalate Ion

Under various contracts several methods for the detection of oxalic acid in citric and tartaric acids and their salts have been sent to the CEE: 3/70 RE.1; 4 to 9/70 RE.1; 28/72 RE.1; 6/74; 10/70 RE.1; 30/68 RE.1.

In his experience, Prof. PELLERIN said, research on oxalates in citric acid and its salts is easily carried out by the method from the European Pharmacopea, based on the Fosse-Schryver reaction. The technique differs from method 30/68 RE.1; this method is not applicable to tartaric acid and its salts. Prof. PELLERIN stressed the fact that all techniques based on the precipitation of calcium oxalate lead to variable results, and do not prove that the strength of oxalate is less than 0.1 % (the CEE norm). Dr. SCHULLER will experiment with the Schryver method and will put forward a limit test for oxalates in these compounds, taking into account the CEE's request to standardize a method as far as possible. The method will be circulated.

4. Schedules for Finalization of Methods

(i) The methods to be circulated should be sent to Prof. PELLERIN before 20 September 1976. (ii) Comments on the methods thus circulated should be sent to Prof. PELLERIN before 15 November 1976. (iii) Finalization of methods would be carried out during 15 November-31 December 1976. (iv) Dispatch to CEE during January 1977; the final date for sending the methods is fixed as 31 January 1977.

F. PELLERIN

COMMISSION ON AUTOMATION IN CLINICAL CHEMISTRY (CACC)

London, 26-27 July 1976

Present: Dr. D. S. YOUNG (Chairman), Dr. J. BIERENS DE HANN, Prof. J. HANS BÜTTNER, Prof. M. HJELM (Titular Members); Prof. T. P. WHITEHEAD (Associate Member).

1. The document 'Characteristics and Attributes of Instruments Intended for Automated Analysis in Clinical Chemistry' was reviewed and extensively revised as a result of criticisms by members of the Commission and others. As a result the document was simplified and

the revised version will be submitted to the Section on Clinical Chemistry for comment. If further revisions are indicated after this review they will be considered by mail by the Commission before the document is formally submitted to IUPAC for publication.

2. A meeting was held with Dr. F. L. MITCHELL (Chairman of the Expert Panel on Instrumentation of the IFCC) to discuss areas of interest and overlap. It is intended that all documents prepared by both the Commission on Automation and the Expert Panel will be exchanged, as will the minutes of meetings of the two groups.

3. Immediate future priorities of the Commission were discussed. Several different possibilities were reviewed. Those determined to be of highest priority were: (a) Interfacing of laboratory instruments with computers; (b) Practical guidelines for development of mechanized analytical instruments. Document (a) will be developed from that already produced by the German Society for Clinical Chemistry. The second document will be prepared from scratch by the Commission.

4. An outline of the guidelines for development of mechanized analytical instruments was discussed. The approach to be used is orientated towards factors affecting function. Major headings to be considered as well as detailed breakdown into subheadings of the item 'Presentation of Specimen/Preparation for Sampling' was developed as a model to be adopted in other cases.

5. Assignments to prepare outlines under each heading were made to the members of the commission, for completion and circulation amongst members by the end of 1976.

6. It was agreed that necessary definitions and substantial completion of the main part of the document would be deferred until the next meeting of the Commission.

7. The Commission agreed to meet during the 29th IUPAC General Assembly in Warsaw. The exact dates will be announced later but will probably be 23-25 August 1977.

COMMISSION ON ATOMIC WEIGHTS: SUBCOMMITTEE FOR ASSESSMENT OF ISOTOPIC COMPOSITION (SAIC)

Saclay, 24-26 August 1976

Present: Prof. E. ROTH (Chairman, Commission II.1), Dr. N. E. HOLDEN (Secretary, Commission II.1), Dr. P. DE BIEVRE (Chair-

man, SAIC), Dr. I. L. BARNES (Secretary, SAIC), Dr. A. E. CAMERON, Dr. R. HAGEMANN, Prof. H. G. THODE (Members).

The main items considered at the meeting as mandated by IUPAC in 1975 were:

1. Correction of errors in fact contained within the table of 'Isotopic Abundances of the Elements as determined by Mass Spectrometry' as submitted to the Commission on Atomic Weights (II.1) in Madrid, 1975.
2. To re-evaluate the table in item 1 and prepare the revised tables for presentation to Commission II.1 at the meeting in Warsaw in 1977.
3. To consider in the table, particularly the atomic weight of the elements as calculated from the recommended isotopic abundances in comparison with the values adapted by Commission II.1 in 1975.

The above items were successfully completed except as noted below. These tasks were assigned to various members to be completed and sent to the secretary in 4-6 weeks.

The members agreed to prepare an element by element review of the values accepted by SAIC as representing the range of abundance for presentation to Commission II.1 in Warsaw.

The members further agreed to recommend to Commission II.1 that a careful assessment of the error limits to be assigned to the recommended isotopic compositions be made.

The tasks assigned to each member were:

A. E. CAMERON

1. Check the Russian articles for reported range of Li.
2. Check literature for variations in N.
3. Prepare element by element review for elements not specifically assigned to other members and edit the final report.

H. THODE

1. Check literature for variations in B, S, Se.
2. Prepare review of B, S, Se and He.

E. ROTH and R. HAGEMANN

1. Check new literature on variations in O.
2. Submit values of Saclay Work on Ru.
3. Prepare review of C, H, O.

L. BARNES

1. Check literature on reported ranges in Si and Cr.
2. Prepare review of elements for which absolute abundances have been done at US National Bureau of Standards.

N. HOLDEN

1. Prepare new reference list for members.
2. Check KAPL for original ratios of Yb and Pt.
3. Check values for S in 51 MACI.

SAIC judged that a meeting would be necessary in 1978 to prepare a final table with error assessments for presentation to Commission II.1 in 1979. H. THODE offered facilities at Hamilton, Canada for this meeting.

As a final action SAIC agreed to refer to Commission II.1 the cases of Zn and Ge. For these elements the mass spectrometric and chemical atomic weights do not agree and the members were unable to find compelling evidence for rejecting either value.

ANALYTICAL CHEMISTRY DIVISION EXECUTIVE COMMITTEE

Aberdeen, 2-3 September 1976

Present: Prof. N. TANAKA (President), Prof. T. S. WEST (Vice-President), Dr. J. C. White (Secretary), Mr. R. W. FENNELL (invited guest).

1. *Nomination/Election Committee 1975-77.* Two positions on the Division Committee must be filled in 1977; one in Zone America and the other in Zone Germany. It was decided that both Federal and Democratic Republics of Germany would comprise Zone Germany. Mr. FENNELL reported the names of Chairman and Members of the Nomination/Election Committee 1975-77.

2. *Nomination and Election for the Division Committee 1977-79.* It was recommended that the Nomination/Election Committee for the period 1977-79 be appointed and approved at the 29th IUPAC General Assembly in Warsaw (August 1977). A line of succession was suggested by which the chairman of the Nomination/Election

Committee would be selected from the membership of the previous committee.

The matter of zonal representatives on the Division Committee was discussed and judged to be a satisfactory means of insuring adequate representation by the Division membership.

3. *Division Finances.* Prof. TANAKA reported that the Division finances were reasonably adequate. The Secretary was asked to seek advance information on administrative expenditures by the various Commissions in 1976 to assist Prof. TANAKA in management of Division funds.

4. *Sponsorship of Symposia.* The matter of sponsorship of symposia by the Analytical Chemistry Division was discussed. It was recommended that the form for approval of sponsorship should include a place for listing all official languages of the meeting.

Programme of Division

5. *Report to Bureau.* The report of the President for the period 1975-76 to the Bureau was discussed from the viewpoint of attempting to make the individual reports by Commission chairmen more uniform. The Secretary was instructed to prepare and send guidelines on how to prepare these reports prior to the next report period.

6. *Compendium on Analytical Nomenclature.* Prof. WEST reported excellent progress on the preparation of manuscript of *Compendium of Analytical Nomenclature*, and stated that he and Prof. IRVING would have it ready for review by the Division Committee at the 29th General Assembly in Warsaw (August 1977). The question was raised as to whether approval by Council was necessary. Prof. TANAKA will explore the matter at the meeting of Bureau in Strasbourg later in September 1976.

7. *Solubility Data Project.* A new *ad hoc* working group between IUPAC and IUCr was approved as part of Commission V.6.

8. *Projects of Commissions.* In the discussion of projects of the Commissions, it was recommended that the President or Vice-President of the Division automatically be a member of the Coordinating Committee for Analytical Methods for CEE and IARC (CCAM).

9. *New Members Approved by Correspondence Through Executive Committee.* The Secretary was instructed to send a letter to Commission chairmen reminding them of the rules of the Division on the selection

of new Titular and Associate members, with particular reference to obtaining an agreement by the proposed member to serve prior to his nomination.

Publications

10. *Nomenclature Format.* Discussion was held concerning the relative merits of narrative versus glossary format for nomenclature documents. It was decided that Prof. WEST would write to Prof. KAISER for agreement on a proposal to the Division Committee. (Since the meeting, news of Prof. KAISER's death was received.)

11. *Revision of 'Report Approval Form'.* The report approval form has been revised by the Secretary to provide more information concerning the status of reports from their preparation to publication.

12. Prof. TANAKA will propose at the Bureau meeting (Strasbourg, September 1977) that Commission chairmen make a determined effort to see that all members who have made contributions to IUPAC reports are properly recognized. In some cases, this can mean the entire Commission membership would be listed.

13. *IUPAC Publications Policy.* It was noted that the whole system of IUPAC publications was under discussion between the Publications Committee and the publisher, with a view to increasing knowledge of IUPAC activities and reports to the widest possible extent.

Collaboration with Applied Chemistry Division and Clinical Chemistry Section

14. *Symposium on Harmonization of Collaborative Analytical Studies.* The recommendation of Dr. EGAN, President of Applied Chemistry Division, that a symposium on 'Harmonization of Collaborative Analytical Studies' be held in Cleveland, Ohio, in March 1978, was approved. Prof. TANAKA will discuss the matter of joint financing of the meeting with Dr. EGAN. The proposed expenditure would be approx. US\$200 from each Division.

15. *Liaison with Applied Chemistry Division.* Liaison with the Applied Chemistry Division was discussed, and efforts will be made to expand

collaboration to all fields of analytical chemistry of mutual interest between Divisions.

16. *Joint Meeting during 29th IUPAC General Assembly.* It was agreed that the Analytical Chemistry Division would hold joint meetings during the General Assembly with Clinical Chemistry and Applied Chemistry Divisions as suggested by Dr. EGAN, and that agenda items would be sent to Dr. COLLINGS, Secretary of Applied Chemistry Division, no later than 30 April 1977.

17. *Cooperation with ISO.* The status of the Division's cooperation with ISO regarding draft standard methods was reviewed. It was agreed that the Secretary would serve as IUPAC coordinator, and that draft methods would be sent directly to the Secretary for review. The Secretary was authorized to grant approval of methods referred to the Division.

18. *Coopted Members on Division Committee.* A long discussion was held concerning the role of coopted members on the Division Committee. The following statement was adopted, which subject to approval by Bureau, will be included in the Division rules as Bylaw 1.111:

'Up to three coopted members may attend Division Committee Meetings. Coopted members may be nominated by the IUPAC International Company Associates Group (ICAG) or other international chemical organizations. Such representation shall lapse at the conclusion of the General Assembly following these appointments unless the person is renominated and reapproved by the Division Committee (a coopted member may not serve for more than two consecutive Assemblies, viz. maximum 4 years).'

19. *Interdivisional Committee on Nomenclature and Symbols.* Discussion was held concerning the IDCNS review of nomenclature reports. Profs. IRVING and SAMUELSON continue to serve as representatives of Analytical Chemistry Division to this Committee.

20. *Analytical Chemistry Division—General Rules.* The general rules of the Division were reviewed and changes made to reflect IUPAC bylaw changes approved at the Madrid meeting (September 1975). Prof. TANAKA will seek to resolve, at the Division Presidents' meeting later this month, the bylaw governing length of service on the Division Committee by Presidents and Past Presidents.

J. C. WHITE

COMMISSION ON PHYSICAL ORGANIC CHEMISTRY (III.2)

La Grande Motte (France), 5 and 7 September 1976

Present: Prof. H. ZOLLINGER (Chairman), Dr. J. PENTON (Secretary), Prof. J. F. BUNNET, Prof. V. GOLD, Prof. Ch. RÜCHARDT (5 September only), Dr. J. TOULLEC (Titular Members). *Observers:* Dr. R. A. Y. JONES, Prof. M. J. PERKINS (Wates Bursary Fellows).

1. Naming of Reactions

General Comments

It was suggested that it would be appropriate for this section to be entitled 'Naming of Transformations'. The term 'Naming of Reactions' implies that every entity participating in a reaction is named and this is not the Commission's intention which is to describe only the change which occurs in the substrate.

It was stressed that the system chosen should be flexible in order to accommodate new reactions, have as few rules as possible and be compatible with English, French and German. Furthermore, it was emphasized that the Commission has no intention of forcing chemists to use new symbolizations: existing conventions would be observed, but it may be necessary to introduce a few strange names.

Use of the System

It was generally agreed that any nomenclature system proposed by the Commission would find its most important use in information retrieval although it would be advantageous if it were also usable in speech or writing. Some spin-off for teaching purposes might also result. As a first priority the Commission should concentrate on formulating names for indexing purposes. The problem of information retrieval by computers was discussed and it was noted that coding systems for chemical reactions had been devised (see, for example, J. E. ASH and E. HYDE, *Chemical Information Systems*, Horwood and Wiley, 1974), but it was decided that adaption for computer retrieval should be left to experts in the field. The point was made that although coding systems for chemical compounds exist, e.g. Wiswesser Line Notation,* they are not used extensively at present except by industry.

*Summarized by E. G. SMITH, *The Wiswesser Line-Formula Chemical Notation*, McGraw-Hill, 1968.

It was stressed, however, that people concerned with this problem, e.g. 'United Kingdom Chemical Information Service' and the 'Institute for Scientific Information' should be kept up-to-date with the Commission's work and their views solicited. Liaison should also be established with *Chemical Abstracts*.

Limits to the System

Although points of contact with inorganic chemistry exist it was thought inadvisable to be too ambitious as far as this field is concerned, although inorganic chemists should be informed of the Commission's work. In the absence of a corresponding Commission in the Inorganic Chemistry Division, the Chairman would personally inform the President of the Inorganic Division of the present work with the view to appointing an inorganic chemist as an Associate Member of the Commission. It was further decided to limit the work to the 'simple' reactions, substitution, addition, elimination, association and dissociation. Although some 'complex' reactions were amenable to symbolization the names produced were often long and unwieldy and it was felt that in the beginning any system would have a better chance of success if it could first be established for simple reactions. Prof. BUNNETT agreed to head a working party to this effect, and the working party would include members of the Commission.

Several suggestions were, however, received for dealing with 'complex' reactions and that of Prof. J. MARCH (Adelphi University, New York) of assigning a common name to each reaction which is not a substitution, addition or elimination was favourably received. It was decided to ask Prof. MARCH to head a working party to explore his views.

There was general agreement that specific problems in the case of 'complex' reactions, e.g. cycloadditions, molecular rearrangements etc., could best be dealt with by means of working groups and the people who expressed interest in the work in their replies to the Commission's report would be asked to participate.

Bunnett System for Naming Substitution Reactions

The Commission reaffirmed its belief that this system is the most concise available and that it could be easily extended to include addition and elimination reactions. It also reaffirmed that there was no intention of replacing common names such as 'nitration' in speech.

It was suggested that in extending the system to addition and elimin-

ation reactions the type of reaction could be made clearer by adding the words 'addition' and 'elimination' or equivalent terms at the end of the name. Alternatively the endings of names for addition and elimination reactions could differ from that of substitution reactions (-ion) or the words Ad--dition and Ex--pulsion could be split up as indicated to enclose the name.

However, it was pointed out that a differentiation in the *ending* of a name would have no advantage for information retrieval purposes. A further alternative could involve the use of symbols A (addition) and D (E) (dissociation or elimination). [For indexing purposes these symbols together with the use of D(E) with 'de' were thought to be a useful redundancy, it being desirable to provide people with a number of options.] Substitution reactions could be treated similarly, i.e. by a prefix Su or addition of the word 'substitution' at the end of the name but it was pointed out that there is no reason why names for substitution reactions should resemble names for additions and eliminations. The Commission agreed that if such flags were introduced they should be compulsory.

On the other hand, the point was made that the nature of a reaction is seen (or heard) immediately from the number of times the term 'de' appears in the name, e.g. addition, 0; substitution, 1; elimination, 2. Some people, however, did not think the term 'de' a strong enough flag for the nature of a reaction, especially in speech, but it was agreed that the term 'de' be separated by a double hyphen, e.g. nitro-de-protiation to indicate a break in the name. It was decided to send out a questionnaire, listing the various alternatives, and ask people to indicate their preference. The suggested alternatives were:

For a 'BrCl' reaction:

<i>Substitution</i> + Br —Cl	<i>Addition</i> + Br + Cl	<i>Elimination</i> —Br —Cl
Bromo-de-chlorination	Bromo-chlorination	De-bromo-de-chlorination
Bromo-de-chloro-substitution	Bromo-chloro-addition	De-bromo-de-chloro-elimination
A-bromo-E-de-chlorination	A-bromo-A-chlorination	E-De-bromo-E-de-chlorination
—	Ad-bromo-chlorodition	Ex-bromo-chloropulsion

It would not be necessary to have a systematic system, e.g. bromo-de-chlorination could represent substitution and ex-bromo-chloropulsion, elimination.

With regard to naming the loss of H, the term de-hydro was thought

to be too easily confused with dehydrogenation and dehydration. It was decided to use the term de-protiation.

The problem of the introduction of two like atoms or groups into a molecule was discussed and it was pointed out that the use of the prefix 'di' in, for example, dibromination was the waste of a flag. Possibly this could be indexed as 'bromo-bromination' or 'bromo-bromobromination'. Furthermore it is ambiguous: 'Dibromination' can mean addition of Br—Br or represent a double substitution reaction, toluene to dibromotoluene, for example.

Although it had been agreed to form a working party to investigate these problems the Commission thought it instructive to consider a number of reactions to see if they could be named reasonably. As a result of this the following tentative suggestions and comments were made and a number of problems noted.

- Numbering should be relative and positions indicated by Greek letters.
- Names should appear in alphabetical order, i.e. bromo before chloro etc., but for substitution the entering group comes first irrespective of initial letter.
- The loss or addition of a single group should be considered, e.g. loss of Cl: dechlorination, chloro-dissociation, chlorolysis? formation of an N-oxide from a tertiary amine: oxylation, oxygenation?
- The nature of a reaction could be reflected in the name. One could build on 'protonation', 'deprotonation' terms. Four names are needed: One for general use, one for cations, one for anions, one for radicals. Suggested endings:

-onation	cation
-idation	anion
-ylation	radical

One problem is that the use of terms such as methylation for the general term would always imply a radical reaction. Exceptions would have to be made in cases such as this. Terms such as protonation and alkylation should be kept.

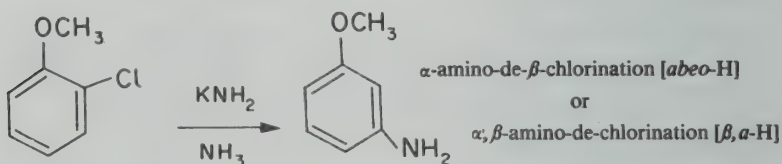
Alternative schemes could involve the addition of symbols +, —, or a dot to indicate the nature of the attacking or leaving group, e.g. bromo(+)—de-proti(+)ation or the use of the words electrophilic, nucleophilic, homolytic. This must be considered by the working party.

- The prefix 'epi' could be a common prefix for reactions which involve addition to π - or σ - bonds to form a 3-membered ring.
- The term 'colligation' could be used for the combination of two radicals. When the radicals are alike the term 'dimerization' should be used.
- Rearrangements could be simply classified, e.g.



as substitution (hydroxy-de-chlorination) + rearrangement.

The substitution reaction could be described more precisely as α, β -hydroxy-de-chlorination where α, β implies a methyl *shift* but does not necessitate one. The term '*abeo*' (Latin: I go away) could be used to represent shift:



or one could even use proto-de-protiation to describe the shift of H. This would be particularly useful in isotopic exchange reactions.

A number of other reactions were examined and although it was obvious that many problems would have to be considered, the Commission agreed unanimously that the basic Bunnett system was capable of extension to handle at least simple rearrangements and that the points mentioned above would be useful for the working party.

Indexing of the System

It was agreed that in cases where a substrate/reagent decision is difficult, e.g. phenylation of aromatics the reactions would be indexed according to both reactants. The Commission registered its awareness of this problem in general, i.e. the question of 'priority of interest' in a reaction but felt this was a subject which should be dealt with after a basic scheme had been devised.

[It was pointed out that the hydrolysis of a cyano group to a carboxylic acid, formerly a simple reaction, would be classed as a substitution, but is actually a more complicated reaction, with an intermediate carboamide. The Commission agreed that eventually both steps would have to be named and it was suggested that this problem be considered by a working group.]

The question of indexing under main headings such as 'Substrate' or 'Type of reaction' would also have to be considered. It was suggested that journal editors could include the systematic name for a reaction in the Abstract.

Propagation of the System

The Commission agreed that this could best be achieved by convincing editors that authors should use the system in their abstracts; and *Chemical Abstracts* should also be persuaded to use the system.

2. Symbolization of Reaction Mechanism Models

Discussion of Mechanistic Models

The Commission agreed that this was a problem which could be handled by working parties. It was further agreed that in the first instance a minimum number of models should be set up to represent how a reaction could occur; these could be extended to embrace a larger number at a later date.

The problem of whether a change in the rate limiting step (with pH for example) in a reaction should be taken to mean the incursion of a new mechanism and hence requiring a new model was discussed and opinions were divided. It was suggested that this decision could be avoided by constructing a scheme for mechanistic models whereby indication of the rate-limiting step is optional (e.g. by a capital R).

Discussion of Various Symbolizations

It was pointed out that an extensive study of a 'simple' reaction such as protonation often reveals that the reaction is complex and this should be borne in mind when considering symbolization. The Commission decided that two symbolizations were needed—a simple system for a crude representation of the mechanism and an extended system for a complete description. The latter would find application in information retrieval and it would be necessary for the two systems to be related.

Concerning the simple system it was felt that an elaboration of the basic Ingold system of symbolization perhaps by indication of intermediates could provide a reasonable basis for discussion. Alternatively, the system of MATHIEU and the system of GUTHRIE which does *not* consider the direction of electron flow were also thought to have merit. The Commission decided to ask Dr. JACKSON (University of Sussex) and Prof. GUTHRIE (University of Kentucky) to chair working parties to investigate the feasibility of both methods of approach.

With regard to the extended symbolization, the Commission considered the extended GUTHRIE system and a system proposed by Dr. LITTLER (University of Bristol) to be the best alternatives available. Again it was stressed that such complex systems will find their use in information retrieval. The Commission was impressed by the fact that the LITTLER system is virtually self-explanatory and could be reduced to the BUNNETT system of nomenclature; but this is not a necessary criterion of a mechanistic symbolization. It was therefore decided to ask Prof. GUTHRIE and Dr. LITTLER to chair two working parties to elaborate their proposals.

3. Definitions Used in Physical Organic Chemistry

A number of words for definition had been submitted to the Commission and it was decided to form a working party to deal with this problem. Prof. GOLD agreed to head the working party and prepare a list of words and scientific terms which would be circulated for additional suggestions.

It was proposed that the working party should also introduce simple terms for processes which have no name but which are amenable to such definition. The working party should be international and it was suggested that the participation of authors of well-known books in the field who naturally have experience in this task would be advantageous.

4. Additional Items

Working Parties

It was decided that working parties should report on their progress after 6 months and aim to prepare a final report after 1 year. It was stressed that the Chairman of the working party should have a completely free hand in choosing members of his party although the Commission could make suggestions if he so wished. There would be

no restriction on the number of members. The following working parties were suggested:

<i>Working Party</i>	<i>(Suggested) Chairman</i>
Glossary of Terms	V. GOLD
Nomenclature of Reactions	
(i) Simple Reactions	J. F. BUNNETT
(ii) Complex Reactions (index of)	J. MARCH
(iii) Rearrangements, cycloadditions	K. MACKENZIE
Symbolization of Reaction Mechanism Models	
(i) Simple symbolization:	
'Ingold' approach	R. A. JACKSON
'Guthrie' approach	R. D. GUTHRIE
(ii) Complex symbolization:	
'Little' system	J. S. LITTLER
'Guthrie' system	R. D. GUTHRIE

Positional Symbolization

It was suggested that the Commission should decide between the alternatives:

- C₂ vs. C₄
- C.2 vs. C.4
- C-2 vs. C-4
- C(2) vs. C(4)

Presentation of Commission's Work

It was suggested that the Chairman, who would talk about the Commission's work to the 3rd IUPAC Conference on Physical Organic Chemistry on 9 September should ask for names of those people interested in participating actively in the Commission's work.

Wates Bursary Fellows

In the general opinion of Commission Members the idea of Wates Bursaries is very useful for IUPAC in general and for Commission III.2 in particular. The Chairman wishes to thank the respective authorities in IUPAC and in UK for their initiative. In addition it was decided to keep Prof. PERKINS and Dr. JONES at least on the mailing list of the Commission and consider some other, more specific relation to the Commission. Unfortunately it was not possible to propose their

election as Titular Members as this is not permitted by the statutes and bylaws of IUPAC.

5. Date and Place of Next Meeting

The Commission tentatively arranged to meet at the 4th IUPAC Conference on Physical Organic Chemistry, York, UK in Summer 1978.

H. ZOLLINGER
J. PENTON

COMMISSION ON NOMENCLATURE OF ORGANIC CHEMISTRY (III.1)

Deauville, 5–12 September 1976

Present: Prof. N. LOZAC'H (Chairman), Prof. J. RIGAUDY (Vice-Chairman), Mr. S. P. KLESNEY (Secretary), Dr. H. GRÜNEWALD, Dr. K. L. LOENING (Titular Members); Dr. W. H. POWELL, Prof. V. VÖGTLE (Associate Members). Dr. W. HOYLE (Wates Bursary Fellow), Prof. P. KARLSON (IUB-IUPAC Commission on Biochemical Nomenclature), Prof. C. LIÉBECQ (Committee of Editors of Biochemical Journals), Dr. G. P. MOSS (Wates Bursary Fellow) attended the meeting as Observers.

1. Minutes of Previous Meeting

The minutes of the meeting held at Santiago de Compostela on 24–30 August 1975 had been published in *Information Bulletin* Nos. 52/53 (May 1977), pp. 34–37.

2. Section E: Stereochemical Nomenclature

The Commission noted that Section E (Recommendations, 1974) had been published in *Pure Appl. Chem.* **45**, 11–30 (1976). It was agreed that in any future revision of section E: (i) the formulas for glyceraldehyde in Rule E–1.2 should also appear in Rule E–1.1. (ii) Priority rules, now given in the Appendix, would be included in the Rules section and no rules will appear in any Appendix. (iii) A need for a term to indicate

a structure which is stereoisomeric, but of unknown configuration particularly in planar stereoisomerism, was noted. Chirality is a term which can be used for optical stereoisomerism. (iv) Definitions, such as for conformation and configuration, should be given, with an explanation that such words or concepts are used as defined in this particular document.

Prof. KLYNE had outlined, in a letter to the Commission, topics to be considered in a revision and extension of Section E. The following topics were also mentioned: study of the use of absolute and relative descriptors as used in the Chemical Abstracts Service (CAS) index nomenclature; development of a system for the designation of non-tetrahedral hetero atoms in rings and chains; and a study of methods for describing absolute and relative configuration of groups of stereogenic centres in acyclic systems. The working party on Section E was reconstituted to carry out revision and extension as follows: F. VÖGTLE (convener), W. KLYNE, K. L. LOENING, K. BLÁHA, J. WEILL-RAYNAL, G. P. MOSS, H. KAGAN, J. BLACKWOOD of CAS was suggested as a consulting expert.

3. Section F: Natural Products

Prof. KLYNE had informed the Commission by correspondence that general rules for naming natural products, designated as Section F, had been sent to the Secretariat for publication. [*Editorial note:* published as Provisional Nomenclature Appendix No. 53 (December 1976) to IUPAC *Inf. Bull.*] Further, Prof. KLYNE had listed some 24 topics for consideration as possible appendices to Section F. It was agreed that this list would provide an excellent starting point for the work of the proposed JCBN and it was decided that CNOC would not need to continue its working party on Section F, for the time being.

4. Section G: Structure-based Systematic Substitutive Nomenclature

The work which heretofore has been called Revision of Sections A, B, C, and D will henceforth be called Section G. This should provide greater freedom in the introduction of new concepts and reorganization of ideas.

Dr. GRÜNEWALD proposed the possibility of total elimination of the use of functional suffixes and prefixes in the systematic nomenclature to be presented in Section G. All atoms (except hydrogen)

would be considered as being a part of a chain, representing a truly structure-based nomenclature system. After discussing the advantages and disadvantages of this proposal it was decided to continue to develop Section G along the lines of the present draft, which provides for a closed list of characteristic groups as suffixes and/or prefixes.

A list of 'recognized nomenclature problem areas' prepared by Dr. POWELL and Prof. LOZAC'H was presented as a guideline for discussion of topics to be covered by Section G. A few of the significant decisions/recommendations are briefly given hereunder:

- (i) The order of precedence of the elements, as given in Table IV of *Nomenclature of Inorganic Chemistry* (2nd Edn.: 1971) was accepted for use in all cases where an element priority system is required. Nitrogen will no longer have the high priority that it has had in naming fused ring systems but will assume its ordinary position. Carbon will also assume its normal position.
- (ii) In the choice of a preferred homogeneous parent hydride, chain length takes precedence over the presence of unsaturation or hetero atoms. Rule C-13.11b and c [of *Nomenclature of Organic Chemistry* (Sections A, B and C: 1971)] are thus inverted. For example, 2-methylenebutane is preferred over 2-ethylpropene and diazanylicosane is preferred over icosyldiazane. Similar principles apply to rings; oxazolopregnane is preferred to pregnanooxazole and oxirenonaphthalene is preferred to naphthooxirene.
- (iii) Hydro prefixes indicating saturation of double bonds will be non-detachable. This means that the 'added hydrogen' technique as used by CAS will no longer be necessary, e.g. 1,2-dihydronaphthalene-1-thione will be used in Section G rather than naphthalene-1(2H)-thione.
- (iv) Locants will be placed immediately before that part of the name to which they refer, e.g. but-1-ene-2-thiol rather than 1-butene-2-thiol.
- (v) In Section G, the suffix '-ol' will be used when the -OH group is the principal characteristic group, even when not attached to a skeletal carbon atom.
- (vi) Suffixes should have a strictly substitutive meaning and that every suffix name must have a structurally equivalent prefix name. Accordingly, it was decided to study the possibility to discontinue the use of the Geneva system for naming acids, acid halides, amides, aldehydes and nitriles in Section G.

- (vii) Suffix 'one' would be used to describe all oxo functions that are not a part of another substituent suffix. Consequently, consideration would be given to the possible elimination of aldehydes as a nomenclature class.
- (viii) Hantzsch-Widman system (Simplification of Rule B-1) will not be included in Section G, but retained as a trivial system.

Because of the extent of the work on Section G, working groups on Heteroatomic Chains and Rings and General Replacement Nomenclature and Sulfur Compounds will be suspended until the impact of Section G developments on these areas are more fully known.

5. Section H: Isotopically Modified Compounds

There was considerable discussion on some points as a result of comments received from CNIC and CBN, as well as from members of CNOC on the April 1976 draft. CNOC was able to resolve these at the meeting. However, at the suggestion of Profs. KARLSON and LIÉBECQ it was decided to prepare and circulate a new draft before publication. Some of the items discussed and decisions taken are summarized hereunder:

- (i) Add a paragraph to explain that the main reason for choosing the system of Section H over the extended Boughton system for codification in the Organic Nomenclature Rules was that it provided for recognition of several different types of isotopic modification.
- (ii) The symbols ^2H and ^3H for deuterium and tritium, respectively, are to be used throughout Section H. The symbols D and T will be recognized only as possible alternatives. 'Deuterio' and 'tritio' will not be recognized.
- (iii) Labeled compounds are designated as *specifically labeled compounds* when *one unique* isotopically substituted compound has been formally added to the analogous isotopically unmodified compound. In this case both position and number of each labeling nuclide are defined.
- (iv) Labeled compounds are designated as *selectively labeled compounds* when a *mixture* of isotopically substituted compounds has been formally added to the analogous isotopically unmodified

compound in such a way that the position(s) but not necessarily the number of each labeling nuclide is defined.

- (v) Objections to the use of the subscript *m* in the isotopic descriptor for selectively labeled compounds have been received, mainly from CNIC members, on the basis that this symbol has been used with an atomic symbol by both chemists and physicists to designate a metastable isotope. Since the placement of this symbol with respect to the atomic symbol has not been consistent, it was agreed that there was sufficient potential confusion and therefore the use of the subscript *m* would be dropped in Section H.

After a lengthy discussion on possible methods to more clearly distinguish between specifically and selectively labeled compounds, the addition of the following new Rule was proposed: 'When the selectively labeled compound arises from a mixture of known specifically labeled compounds, the number or the various possible numbers of labeling nuclides for each position may be indicated as subscripts to the atomic symbol. When two or more subscripts apply to the same nuclide symbol, they are separated by semi-colons. For mixed labeled compounds the subscripts of the various atomic symbols are written in corresponding order. For example: a mixture of $\text{CH}_2^2\text{H}_2\text{-CH}_2\text{-OH}$ with $\text{CH}_2^2\text{H}_2\text{-CH}_2\text{-}^{18}\text{OH}$ is described by the formula $[\text{}^{18}\text{O}]\text{CH}[\text{}^2\text{H}_2]\text{CH}_2\text{-OH}$ and the name $[2,2\text{-}^2\text{H}_2, \text{}^{18}\text{O}_{0;1}]\text{Ethanol}$; a mixture of $\text{CH}_2^2\text{H-CH}_2\text{OH}$ with $\text{CH}_2^2\text{H}_2\text{-CH}_2\text{-OH}$ is described by the formula $[2\text{-}^2\text{H}_{1;2}]\text{CH}_3\text{CH}_2\text{OH}$ and the name $[2\text{-}^2\text{H}_{1;2}] = \text{Ethanol}$.'

- (vi) Add a new rule to deal with the concept of isotopically deficient compounds following the suggestion from CNIC. The following wording was suggested: 'Compounds in which the isotopic content of one or more elements has been depleted, i.e., the isotopic content is less than the natural ratio, are called isotopically deficient compounds and are denoted in the formula and name by adding the italicized syllable *def* immediately preceding and without hyphen before the appropriate nuclide symbol, e.g. $[\textit{def}^{13}\text{C}]\text{CHCl}_3$, $[\textit{def}=\text{}^{13}\text{C}]\text{Chloroform}$.' The reason for the choice of the symbol *def* (for deficient) is that the word depleted implies more of an operation whereas deficient describes a result.

Editorial Note: The document has since been published as Provisional Nomenclature Appendix No. 62 (July 1977) to IUPAC *Information Bulletin*.

6. Nodal Nomenclature

Draft 4 (August 1976) was reviewed at this meeting only to identify any general problems. Prof. LOZAC'H asked that detailed comments be submitted to him as soon as possible. Some of the points considered are briefly presented below: (i) It was noted that the priority order for choosing the senior nodal unit, i.e. the largest number of modes followed by preference for a cyclic system was quite analogous to the decision made for priority order for selection of a parent hydride in Section G. (ii) The glossary should be expanded and where needed, cross-references should be made to pertinent sections. (iii) Prof. VÖGTLE will develop the 'phane' nomenclature concept, one of the uses foreseen for the nodal system. (iv) The use of a bracketed cipher for monocycles was approved, even though redundant. (v) Procedures for developing the structure from the name should be included, presumably to follow Section C on assemblies of cyclic and acyclic nodes.

7. Sulfur Compounds

Prof. K. A. JENSEN had prepared a long document on the nomenclature of sulfur compounds for the Santiago meeting (1975) which was redistributed in March 1976, for further comment. Dr. POWELL has responded to this document by summarizing different types of names that could be used for the examples in the document. It was decided that further consideration of the problems of sulfur nomenclature should be postponed until the impact of the developing λ convention and general skeletal nomenclature system is more fully known. Thus, the working party on sulfur compounds will be temporarily suspended insofar as CNOC is concerned.

8. Fluorinated Compounds

In reference to the document 'Revised Nomenclature of Highly Fluorinated Organic Compounds' by J. A. YOUNG [*J. Chem. Doc.* **14**, 98 (1974)] it was agreed that many of the problems dealt with by this document could be considered as more general and should be considered after work on Section G and the nodal nomenclature system has progressed further. A recent document on the nomenclature of highly fluorinated organic compounds was noted [W. LIEBSCHER and P. DIETRICH, *Z. Chem.* **16**(4), 144-5 (1976)].

9. Ions and Radicals

Two documents dealing with the nomenclature of ions and radicals by substitutive nomenclature principles were distributed to the working group by Prof. LOZAC'H. One was mainly a summary and status report of the nomenclature of classical ions and radicals as discussed by both CNOC and CNIC at the Santiago meetings (1975) and the other dealt with the nomenclature of non-classical carbocations. After discussion of comments it was decided that Dr. POWELL will attempt to document these proposals for further evaluation in connection with the preparation of Section G as well as publication as a refinement and extension of the λ system of Section D.

10. Cryptates (Macrocyclic Ligands and their Complexes)

In response to a request for ideas on the nature and scope of the problems that should be considered by this working group, substantive replies were received from only Prof. J. M. LEHN and Dr. BUSCH. Prof. VÖGTLE drew attention to a paper [*Z. Chem.* **15**(10), 394-5 (1975)] on poly(oxyethylene) compounds that might be of interest for this working group. Dr. POWELL will prepare a status report of this subject based on the available information for consideration by the working group. Prof. VÖGTLE joined the working group and offered to send some reprints.

11. Biochemical Nomenclature

Prof. KARLSON reported on the status of the new joint committee being proposed to deal with biochemical nomenclature, JCBN. This proposed committee will be independent of CNOC and will consist of four members from IUPAC, four members from CBN, and four members from IUB. CNOC recommended that one of its Titular Members should always hold one of the IUPAC memberships on JCBN and that CNOC be authorized to nominate one other of the IUPAC memberships. If this is approved, CNOC selected Dr. LOENING as its Titular Member representative and proposed Prof. KLYNE as its nominee for another IUPAC member on JCBN.

Amino Acids. Dr. P. O. LARSEN had notified a problem with the use of the prefix 'allo'. His arguments were considered in detail with the following conclusions: (a) The use of the prefix 'allo' for the trivial names now given in Amino acid rule 5.4 is retained. (b) The prefix 'allo' is *not* to be used with new trivial names. (c) When the amino

acid rules are next revised, a new rule, 5.5, should be added recommending the use of the R, S, R*, S* symbolism as recommended by the Section E stereochemical rules, where applicable.

At the present time there is no working group on amino acid nomenclature. Documents and comments on amino acid nomenclature should be sent to Dr. BLÅHA, as CNOC contact, Prof. RIGAUDY and Mr. KLESNEY.

Lipids. The most recent document on lipid nomenclature available to CNOC was the March 1976 draft. Prof. KARLSON assured the Commission that comments received from CNOC members had been carefully considered at the meeting of CBN in New York (31 May–3 June 1976); some additional comments were discussed and agreed. The revised document will be distributed to the editors of biochemical journals, to CBN, and to CNOC.

Tetrapyrroles. Prof. KARLSON reported that this document has been thoroughly discussed and approved by CBN at its meeting in New York (31 May–3 June 1976). He emphasized that CBN would like to see this document published as soon as possible; publication has been delayed to allow for consideration of a few problems noted by CNIC. CNOC gave its approval to the document pending final editing by Dr. K. L. LOENING. Final comments by CNIC are to be sent to Dr. LOENING.

Phosphorus Compounds of Biochemical Importance. The most recent document on this subject available to CNOC was the April 1976 draft. Prof. KARLSON reported that this document was discussed extensively by CBN at its New York meeting (31 May–3 June 1976); comments by CNOC members were carefully considered and, for the most part, were adopted. The revised document will be reviewed on behalf of CNOC by a working group consisting of Dr. LOENING, Dr. POWELL, and Mr. KLESNEY. It will then be ready for approval by CBN and IUPAC prior to publication.

Carbohydrates. Three documents were distributed in August 1976 by Prof. H. PAULSEN: (i) Nomenclature of Branched-chain Monosaccharides and Sugars with Unequal Geminal Substitution; (ii) Rules for the Nomenclature of Unsaturated Monosaccharides; and (iii) Rules for Conformational Nomenclature for Five- and Six-membered Ring Forms of Monosaccharides and their Derivatives.

Prof. KARLSON stated that these documents were still in preliminary stages and not at all ready for publication. It was noted that at least two CNOC members did not receive these documents prior to the

meeting. Several general comments were made and it was decided that all comments on the carbohydrate documents should be sent to Prof. RIGAUDY who was added to the carbohydrate working group as the CNOC contact. Prof. RIGAUDY will collate them for transmittal to Prof. PAULSEN.

Prostaglandins. Prof. KARLSON reported that a document was being prepared by the working group that would likely be ready for distribution to CNOC the next year.

Lignins. There was no activity in this area to report. It was the opinion of CNOC that this subject should be considered as one of the appendices to Section F, which should be handled under the proposed JCBN structure.

12. Interdivisional Committee on Nomenclature and Symbols (IDCNS)

A meeting of IDCNS was held in Oxford on 16–18 September 1976 [for minutes see *Information Bulletin* Nos. 52/53 (May 1977), pp. 83–96]. Items of special interest to CNOC are: (i) The programme to sponsor the attendance of young chemists in IUPAC work. CNOC was especially pleased with the participation of Dr. G. P. MOSS (Queen Mary College, London) and Dr. W. HOYLE (Ciba-Geigy, Manchester). (ii) Prof. LOZAC'H reviewed the activities of CNOC with particular emphasis on the decisions reached at Deauville. (iii) In the preparation of documents concerning nomenclature and symbols, the classification into Class I–IV documents had been recommended. All documents except those of Class IV should be marked: 'Working draft, not official rules of IUPAC'.

13. Next Meeting

At Deauville, the 1977 meeting had been tentatively set for 15–20 August at Liblice, Czechoslovakia. However, at the IDCNS meeting it was announced that the dates of the IUPAC Conference in Warsaw, Poland, would be 12–21 August 1977. Therefore the place and dates of the 1977 meeting of CNOC will be announced later.

S. P. KLESNEY

COMMISSION ON ELECTROCHEMISTRY (I.3)

Zürich, 9 and 12 September 1976

Present: Prof. N. IBL (Chairman), Dr. R. PARSONS (Vice-Chairman), Dr. J. C. JUSTICE (Secretary), Prof. K. E. HEUSLER, Dr. J. KÚTA, Prof. S. TRASATTI, Prof. E. B. YEAGER (Titular Members); Prof. I. EPELBOIN, Dr. M. FROMENT (Associate Members). Dr. DESLOUIS, Dr. H. FALTEN, Prof. J. NEWMAN, Prof. H. W. NÜRNBERG (Commission V.5) attended the meeting on 9 September by invitation.

1. The minutes of the previous meeting (Madrid, Spain: 3, 5, 6 September 1975) had been published in *Comptes Rendus 28th Conference: Part B*, pp. 183-186.

2. The report by Prof. IBL on 'Mass Transport Phenomena' was thoroughly discussed. The rewording of a number of paragraphs by Prof. NEWMAN was gratefully acknowledged. A revised version of the report will be prepared by Prof. IBL according to the decisions taken at the meeting in Zürich and submitted for publication as a provisional nomenclature document.

3. The report on 'Electrode Reaction Orders' by Dr. PARSONS was then discussed. A final version will be presented and published as a provisional nomenclature document.

[*Editorial Note:* The documents mentioned in items 2 and 3 have since been published as Provisional Nomenclature Appendices Nos. 59 and 60 (July 1977) to the IUPAC *Information Bulletin*.]

4. A brief report was made by Dr. JUSTICE on the status of the project on 'Conductance Data Compilation'. Bibliographical data are being collected on one hand; on the other hand computer programmes are being written in order to process, to select, to classify, to transfer or list according to chosen criteria all or part of the stored information. An operational compilation should be available for the next meeting of the Commission in Warsaw (1977).

5. At the 28th IUPAC Conference (Madrid: September 1975) a joint meeting of the Commissions on Electrochemistry (I.3) and Colloid and Surface Chemistry (I.6) was held. The Commission on Electrochemistry was informed of the plans of Commission I.6 concerning a report on the 'Surface Chemical Physics of Solids'. It was agreed in Madrid that a joint working group of the two Commissions should be designated to participate on behalf of each Commission in this working group. The members of Commission I.3 proposed to

take part in this group will be Dr. FROMENT, Prof. HEUSLER and Prof. TRASATTI. Prof. IBL will inform Chairman of Commission I.6 of this decision.

6. A report of the joint meeting with Commission V.5 (Paris: July 1976) was made by Prof. IBL who pointed out the deep interest which both Commissions had shown for each others respective activities and the thorough discussions which had followed the report on the various projects presented.

7. Among the future activities envisaged by Commission I.3 the 'Elaboration of Tables of Selected Values of Electrode Potentials' was considered and retained as the next project to go forward.

8. Prof. YEAGER announced his resignation as Titular Member because of his many present commitments which he felt will prevent him continuing to contribute actively to the work of the Commission. He proposed that Prof. A. BARD be nominated as Titular Member in his place. Prof. BARD had already given his agreement to participate with Dr. PARSONS on the 'Elaboration of Tables of Electrode Potentials'. The nomination of Prof. BARD was unanimously accepted by the Titular Members present. Prof. IBL, as Chairman of the Commission, will promptly inform the Chairman of the Physical Chemistry Division of this nomination in order to make the attendance of Prof. BARD possible at the 29th IUPAC General Assembly in Warsaw in 1977. Members of the Commission unanimously expressed their gratitude and thanks to Prof. YEAGER for his active cooperation, and his much appreciated contributions.

N. IBL
J. C. JUSTICE

COMMISSION ON FOOD CONTAMINANTS (VI.2)

Paris, 13-15 September 1976

Present: Dr. K. KOJIMA (Chairman), Dr. K. OHNO (Secretary), Dr. A. D. CAMPBELL, Dr. L. E. COLES, Dr. M. JEMMALI, Dr. P. KROGH, Dr. P. L. SCHULLER, Mr. M. V. TRACEY (Titular

Members); Prof. G. BILLEK, Mr. F. BRO-RASMUSSEN, Dr. A. J. COLLINGS, Dr. J. D. LITTEHAILES, Prof. R. TRUHAUT (Associate Members); Dr. A. E. POHLAND (Observer, US-FDA).

1. Minutes of Previous Meeting

The minutes of the meeting held in Madrid on 2-5 September 1975 (see *Comptes Rendus 28th Conference; Part B*, pp. 314-320) were approved after a minor amendment.

2. Reports Completed or Nearing Completion

Determination of Mercury in Food. It was decided to circulate the draft of the revised method (to be prepared by Dr. GUTHENBERG) to Members for comment, before its publication as an IUPAC standard method in a Technical Report appendix to the *Inf. Bull.*

Shotwell Procedure for Determination of Aflatoxin in Corn. Dr. CAMPBELL reported that the final draft of the method will be completed by the end of October 1976, circulated to Members for comment and subsequently published as an IUPAC recommended method in a Technical Report.

Nesheim Procedure (TLC method) for Determination of Ochratoxin. Dr. KROGH reported that the method has been published as Technical Report No. 14 (September 1976) entitled 'Recommended Method for Ochratoxin A and B in Barley'.

Romer Screening Procedure (minicolumn method) for the Detection of Aflatoxins. It was decided to publish this procedure as an IUPAC recommended method because of its growing acceptance and international use. Dr. CAMPBELL will ask Mr. ROMER to prepare the manuscript by the end of the year when it will be sent to Members for comments, and then forwarded to IUPAC Secretariat for publication as a Technical Report.

3. Cooperation with International Organizations

The increasing importance of cooperation at international level on problems of mycotoxins was reflected in the following activities of the Commission:

- (i) Dr. KOJIMA was asked to comment (through Dr. MARCUSE) on 4 ISO documents relating to tests of meat and meat products.

- (ii) Dr. KOJIMA reported that he and Mr. DODGEN (Commission on Food Additives) represented the interests of IUPAC at the 20th Session of the Joint FAO/WHO Expert Committee on Food Additives held in Rome (April 1976) and he had submitted the report to the Secretariat.
- (iii) FAO had asked Dr. JEMMALI and Dr. KROGH to cooperate in the preparation of the FAO/WHO/UNEP International Conference on Mycotoxins to be held in 1977 or in early 1978, in order to provide basic information on mycotoxins in foodstuffs. Dr. JEMMALI will prepare a report covering North African and some European countries, and Dr. KROGH's report will cover some East-European, Balkan and Scandinavian countries.
- (iv) Dr. KROGH had participated in a working group in IARC (International Agency on Research on Cancer) in October 1975 to prepare the Volume 10 of the IARC Monographs on the Evaluation of Chemical Carcinogens, entitled *Some Naturally Occurring Substances*.
- (v) Some Members had participated in training courses on mycotoxins as follows: (a) Dr. KROGH lectured on the toxicology and sampling aspects at the FAO 'Workshop on Aflatoxins' held at Mysore (India) in March 1976. (b) Dr. CAMPBELL had arranged a mycotoxin training course for 6 FAO fellows from Latin America in April 1975. It started with a 2½ day 'AOAC Mycotoxin Workshop' followed by training in various aspects of the problem in US-FDA and USDA laboratories. (c) A similar course is being arranged in conjunction with the Conference of Mycotoxins in Human and Animal Health to be held in Maryland (USA) in October 1976, and Drs. CAMPBELL, JEMMALI, and KROGH will present lectures. (d) Drs. CAMPBELL, JEMMALI, KROGH and SCHULLER are advising FAO in training courses to be run throughout the world.
- (vi) Other activities of Members on mycotoxins are as follows: Dr. KROGH will act as a WHO consultant to US-FDA with emphasis on ochratoxin in October of this year; Drs. JEMMALI, KROGH and SCHULLER are government representatives in the Expert Committee on Analysis of Feedstuffs of the European Economic Community which deals with the harmonization of methods of analysis for the determination of aflatoxin B₁ in feed.

4. Report on Current Projects

Collection of Information on Food Contaminants Derived from Food Packaging. A working paper prepared by Prof. BILLEK on analysis and migration of vinylidene chloride (VDC) monomer into food from polyvinylidene chloride (PVDC) coating was distributed to Members for comment. The paper is to be sent to IARC for information and consideration. Prof. BILLEK reported on a new method of determining the amount of migration of additives used in packaging material into the packed food, using C-14 labelled fat simulant. A brief description of the method will be distributed to Members for comments.

Detoxification of Mycotoxin-contaminated Foodstuffs. This is to be considered as one of the main topics at the Symposium on Mycotoxins in Foodstuffs to be held on 16-18 September 1976 in Paris. The Commission recognized the importance of studying all aspects of minimizing contamination by mycotoxins.

Multi-mycotoxin Analysis. Drs. CAMPBELL, KROGH, JEMMALI and POHLAND agreed to discuss with Dr. STEYN the current status of methods for multi-mycotoxin analysis at the Conference on Mycotoxins in Human and Animal Health in Maryland (USA) in October 1976. If an adequate method is available, consideration will be given for a collaborative study.

Third IUPAC Symposium on Mycotoxins in Foodstuffs. Dr. JEMMALI reported that the Symposium sponsored by the Commission will be held on 16-18 September, immediately after the Commission meeting. About 320 participants from 40 countries are expected to attend the Symposium. The proceeding of the Symposium will be published by the end of 1976. Main lectures from the Symposium have been published in the IUPAC journal *Pure and Applied Chemistry*, Vol. 49, No. 11 (1977) by Pergamon Press.

Determination of Lead and Cadmium in Food. Methods using the wet digestion procedure as well as the dry ashing procedure, followed by atomic absorption had been studied cooperatively. A report prepared by Dr. SCHULLER on the methods was discussed, and it was decided to publish both methods as IUPAC recommended methods in Technical Report appendices to *Inf. Bull.*, with a summary of the result of the cooperative study. The Commission also recognized that the old IUPAC standard method is still valid.

Determination of Copper in Food. The Commission decided to publish the final draft of the revised method for the determination of copper prepared by Dr. SCHULLER as an IUPAC standard method in a Technical Report appendix to the *Inf. Bull.*

Determination of Selenium in Food. The Commission decided to carry out a collaborative study, if possible with the cooperation of AOAC, on the procedure recommended by Dr. COLES. Dr. CAMPBELL will discuss the ongoing study with appropriate AOAC referees to see if it is possible for IUPAC Members to participate in this study. Dr. COLES, Dr. SCHULLER, Mr. BRO-RASMUSSEN and Dr. LITTLEHAILES agreed to try to cooperate.

Single Cell Proteins. As decided at the previous meeting, it was agreed that Dr. LITTLEHAILES, Dr. OHNO and Mr. TRACEY be included in the Working Group to be organized jointly with the Commission on Fermentation as well as other bodies outside of IUPAC to carry out work on the analytical aspects of the project.

Minicolumn Method for Ochratoxin. Although it has been recognized that the existing minicolumn method for ochratoxin is not sensitive enough for analysis of foods, this method is found useful in the analysis of feeds. It was therefore agreed to organize a collaborative study (as decided at the previous meeting) on the method published in *J. Assoc. Offic. Anal. Chem.* **58**(1), 156-158 (1975). Dr. SCHULLER, Dr. JEMMALI and Prof. BILLEK agreed to participate in the study, and additional participants will be looked for in the Netherlands, Poland, Scandinavian countries, USA, Yugoslavia and other countries.

Mycotoxin Formation during Shipment of Foodstuffs. A summary of a paper prepared by Dr. HAYAKAWA *et al.* on the formation of aflatoxins during shipment of groundnut extraction meal from India to Japan was circulated. This is a very interesting study and it was felt that publication of the study should be undertaken as a preliminary report, because it may encourage others to conduct studies on this important subject. Dr. KOJIMA stated that the authors are planning a study on maize shipped from Thailand to Japan.

Sampling Plans for Mycotoxin Analysis. The AOAC Subcommittee on Sampling and Sample Preparation for Mycotoxin Analysis still plans to publish a handbook on the subject. The Commission Members are being considered as contributors and some of them will be asked to review the document prior to publication. Dr. T. WHITAKER

addressed the Commission on the subject of sampling for mycotoxin analysis. This afforded an excellent opportunity for discussion of this subject with an expert on the subject.

Mycotoxin Residues in Food of Animal Origin. The Commission agreed to carry out a collaborative study on a method proposed by Dr. JEMMALI, using naturally contaminated meat. Some difficulties concerning the preparation and distribution of samples were discussed. Dr. KROGH, Prof. BILLEK, Mr. TRACEY, Dr. CAMPBELL and Dr. SCHULLER agreed to participate.

Method of Determination for Aflatoxin M₁ in Dairy Products. Dr. SCHULLER reported that a collaborative study of a new Dutch method was carried out in the Netherlands. An unknown spot had sometimes been observed in the thin-layer plate, as well as in the Stubblefield method. It was agreed that this problem should be first resolved before considering further action.

5. Proposals for New Projects

Tin in Food. The need of a study on tin as an important contaminant in food was discussed and it was decided to take up this as a new project. Dr. COLLINGS agreed to be the coordinator.

Animal Waste for Animal Feed. Dr. CAMPBELL reported on the work carried out by US-FDA on the use of animal waste for animal feed, and it was decided to circulate the information, when published, and to consider the need for further study on this subject. The Commission also recognized that this subject might be one of the main concerns of the Commission on Reclamation of Solid Wastes, and decided to contact them when the information becomes available.

Toxins Produced by Fungi. It was agreed that a more clearcut view was desirable for work on 'Toxins Produced by Fungi' proposed by Dr. STEYN at the last meeting.

Fluoride in Food. It was agreed that 'Fluoride in Food' be considered as a possible future project.

Marine Toxins as Contaminants of Seafoods. A working paper entitled 'Determination of Saxitoxin' prepared by Dr. KROGH was circulated to Members for comment, and it was decided that this relevant subject be a new project. A draft of a chemical procedure for determination of saxitoxin in shellfish will be prepared by Dr. KROGH for the next

meeting in order then to launch a collaborative study. (Note: Dr. COLLINGS will contact SCOR in this connection.)

A Compilation of IUPAC Recommended Methods for Determination of Mycotoxins. There have been a number of IUPAC publications on mycotoxins over the past years. It was felt that a compilation of these with a brief note would be very helpful to those wishing to use internationally recommended procedures and other relevant information, and the Commission decided to take this up as a new project. Drs. CAMPBELL and KROGH agreed to be coordinators.

Specification on Mycotoxin Analytical Standards. The Commission recognized urgent need for reliable specifications of mycotoxin standards, which are essential for good analytical work. No international organization, except IUPAC, is presently working on this aspect. It was therefore felt that IUPAC should continue the activity, initiated by the publication of aflatoxins B₁, B₂, G₁, G₂ and M standards, by collecting and publishing specifications on other mycotoxin standards, and it was agreed that the following mycotoxins be considered first: (i) Ochratoxin (Dr. KROGH as a coordinator); (ii) Zearalenone (Dr. JEMMALI as a coordinator). Other mycotoxins, such as trichothecenes, citrinin, penicillic acid, sterigmatocystin, and patulin may be considered in the future.

6. Other Matters

Appointment of the Vice-Chairman. Based on the decisions of the Applied Chemistry Division Committee meeting in July 1976, the Chairman appointed and the Commission approved Dr. SCHULLER as the Vice-Chairman.

Mycotoxins in Spices. The Commission was informed by the Commission on Food Additives that a study on 'Mycotoxins in Spices' is one of the items on which industries are likely to ask IUPAC to work.

Procedure for Collaborative Studies. Dr. COLLINGS reported that this was a project of Applied Chemistry Division Committee, and the Commission agreed to cooperate on the project by supplying Dr. COLLINGS with relevant information.

K. OHNO

COMMISSION ON OILS AND FATS (VI.4)

Lyngby, 8-11 June 1976

Present: Drs. H. J. VOS (Chairman), Prof. C. PAQUOT (Secretary), Dr. H. BRÜSCHWEILER, Prof. E. L. DELVAUX, Dr. D. FIRESTONE, Dr. J. GRACIANTOUS, Mr. A. T. MØLLER, Dr. J. C. van der WEEL (Titular Members); Prof. T. ASAHARA, Ing. C. CAROLA, Mr. A. PETERSEN, Prof. H. WESSELS, Mr. J.-P. WOLFF (Associate Members); Dr. A. R. JOHNSON, Dr. A. HAUTFENNE, Dr. J. BEARE-ROGERS, Mr. S. B. LINTZ CHRISTENSEN, Dr. M. TEUPEL, Dr. H. H. R. H. WENDT, Dr. E. KURUCZ, Mr. B. MCGWYNNE, Prof. R. MONACELLI, Prof. E. TISCORNIA, Drs. P. W. HENDRIKSE, Dr. Ö. LEVIN, Dr. R. OHLSON, Dr. P. R. E. LEWKOWITSCH, Dr. K. A. WILLIAMS, Dr. N. D. EMBREE (National Representatives); H. CHAVERON, P. GREVE, W. POCKLINGTON, Mme. H. WERNER (Observers). Drs. H. EGAN (in part) and R. MARCUSE (Applied Chemistry Division Committee) attended by invitation.

1. Minutes of Previous Meetings

The minutes of the meeting held in Madrid on 3-6 September 1975 (see *Comptes Rendus 28th Conference: Part B*, pp. 326-330) were approved.

2. Chairman's Report

- (i) The Chairman pointed to the change in name from 'Section' to 'Commission' following the adoption of the new Statutes and Bylaws in Madrid (1975); the Commission is trying to have it renamed to 'Commission on Oils, Fats, and Derivatives'.
- (ii) Bureau had agreed that in the exceptional circumstances of the Commission: (a) a maximum of two National Representatives from each member country be permitted to serve on the Commission during 1975-77; (b) a maximum of twelve Associate Members be permitted during 1975-79.
- (iii) The terms of the Chairman and Secretary are scheduled to expire in 1977 and members should think in terms of elections to fill these positions.

3. Reports of Working Groups (WGs)

WG 2: Determination of Total Oxidized Fatty Acids by TLC and Densitometry

In the absence of the Chairman of WG 2 (Prof. M. NAUDET) Mr. WOLFF gave a summary of the work and presented the results. The initial aim had been to improve and replace the old method of analysis of oxidized acids (I.I.D.12) so as to include the determination of polymerized acids as well. He reminded the Commission that development of improved method was a research problem and not just routine analysis. After some discussion it was decided that three separate experiments be carried out in 1976-77 on three different oils from France—a low grade and a medium grade oxidized oils as well as a frying oil. The analyses will be carried out (a) by Prof. NAUDET's method, (b) a different method proposed by Dr. J. POKORNÝ and the results will be compared. It was stipulated that operators not having access to photodensitometry equipment will work solely in accordance with POKORNÝ's method. At the suggestion of Ing. CAROLA, who questioned the stability of oil samples, it was decided to date the oil samples and the analysis.

WG 3: Determination of Tocopherols (free and esterified) in Oils, Fats, and Margarine

Drs. HENDRIKSE presenting his report stated that the HPLC method is less suitable for recommendation as an IUPAC standard method since the column had to be renewed after a couple of separations because of deterioration. He informed that TLC-GLC combination method is a tentative procedure which will serve as a basis for collaborative testing through AOAC. It was agreed that WG 3 should participate in the collaborative testing of TLC-GLC method and that Dr. FIRESTONE will establish liaison with AOAC. Drs. HENDRIKSE had used voltametric method by differential pulse polarography with good results and it was agreed that efforts should be made to develop the polarographic method.

WG 4: Determination of Chlorinated Pesticides in Oils and Fats

Prof. DELVAUX presented the report on a method developed by Dr. P. GREVE. A discussion developed on the relative merits of NÖREN and WESTÖÖ's method which was better known and GREVE's method which was simpler. For pesticides Prof. DELVAUX agreed that the reference method should be that of NÖREN and WESTÖÖ

and that of GREVE should serve as a routine method; whereas MILL's method should be used in particularly difficult cases. During 1976-77 these methods will be tested and the results provided to the Commission by an agreed date.

Prof. PAQUOT queried the possible determination of organophosphorus pesticides. Prof. DELVAUX replied that the problem was a difficult one and special equipment was needed; he agreed to present a report next year.

WG 5: Determination of Content of cis-cis Linoleic Acid of Oils, Fats, and Margarine

Dr. LEVIN presented the report of collaborative analysis carried out by 17 laboratories and explained it with the aid of several tables which summarized the results. The problem of enzyme activity and regularity was brought up. With the present state of commercial enzymes it was considered necessary to have an 'activity' which is greater than a certain number in order to obtain worthwhile results. Another problem was that of the value of specific extinction at 234 nm of pure linoleic peroxide. The Chairman proposed that some laboratories should study the method using various commercial enzymes and that a test for the determination of enzyme activity should be incorporated in the text of the method. Dr. LEVIN agreed and further suggested that an attempt be made to determine the effect of impurities present in the enzymes on their activities.

WG 6: Determination of Oil Content of Oil Seeds by NMR Techniques

Mr. WOLFF having distributed a table of new results summarized the conclusions of his report: (i) the official reference method (I.B.1) does not always produce good results, particularly in the case of sunflower; (ii) the NMR method produces results of the same sort or with less variation; (iii) the NMR apparatus can be calibrated by being dosed with the same oil prior to carrying out analysis. After some discussion it was decided that new analyses will be carried out by the two methods I.B.1 and NMR on three seeds: (i) soya, (ii) groundnuts (peanuts), (iii) rape (sunflower being set aside for the present) with the greatest possible number of participants.

WG 7: Changes Taking Place in Oils and Fats During Deep Fat Frying

Prof. WESSELS presented his report on the two methods—column and gas chromatographic—he had used for investigation. It seemed necessary to establish a liaison between WG 2 and WG 7 and this was

realized since Prof. NAUDET was a member of both groups. It was decided that further investigations be carried out using both methods: (i) chromatography on a column of aluminium hydroxide (E.C.N. of Guillaumin); and (ii) gas chromatography (Waltking).

WG 8: Identification and Determination of Emulsifiers (derived from fatty material) in Oils, Fats, Fat Products, Cosmetics etc.

Dr. BRÜSCHWEILER presented his detailed report, gave an oral summary of it, and revealed his work programme. The Chairman asked him to restrict the work to emulsifiers contained in oils and fats since the problem of their extraction from food was the work of another Commission. Dr. BRÜSCHWEILER proposed to proceed to separation of emulsifiers using thin-layer chromatography, such a separation being also able to lead to fractions composed of mixtures, e.g. monoglycerides and diglycerides of oxidized acids. The Group intended to work on samples supplied by Dr. BRÜSCHWEILER using his proposed method. Dr. BRÜSCHWEILER also requested Commission Members to send him lists of official methods adopted in their countries for identification and determination of emulsifiers.

WG 10: Realization of Proposed Activities on Soaps and Oleochemicals

Mr. MØLLER mentioned the lists of standards that he had received so far. The Chairman asked WG 10 to complete this list, to compare existing methods, and then to begin the tests. Prof. PAQUOT wanted that the first tests should deal with glycerines since this section had to be published in the 6th Edition of *Standard Methods for the Analysis of Oils, Fats, and Soaps*. Immediately afterwards the methods on alkaline soaps will need to be studied.

WG 11: Determination of Total Fat Content of Margarine

In the absence of Prof. NAUDET (Chairman of WG 11), Mr. WOLFF presented the report and reminded the members that the operators who carry out the determinations should use their own samples; the aim was to develop/ascertain a method for the determination of total fat content of margarine—either by a direct or indirect method. The Chairman asked that the tests be carried out applying the two proposed methods (making improvements in them, as necessary) on: (i) personal samples of ordinary margarine; and (ii) 40% margarine.

WG 12: Determination of Plastic Polymers in Oils and Fats

Dr. van der WEEL presenting his report explained that the Group had aimed at the determination of polyethylene in technical and edible oils, viz. the polyethylene which comes into the fat by processing of the fat; minor amounts of plastics which come into the fats by migration was excluded. Dr. van der WEEL proposed that WG 12 work closely with the Committee established by ISO (ISO/TC 34/SC11). This proposal was accepted and Dr. van der WEEL was entrusted with the task of making contact with ISO as well as with the British Animator when he was appointed. (It was noted that British Standards Institution will hold the Secretariat for this ISO Committee.)

WG 13: Determination of Plastic-based Contaminants (other than Polyethylene) in Oils and Fats

Presenting his report Dr. LEVIN summarized that oils are capable of extracting lipophyle constituents (notably monomers and oligomers) of plastic packaging materials—and that only the case of vinyl chloride had been considered so far. For this investigation he would use the 'head-space technique' in gas chromatography. It was noted that the Group was now established and would undertake to study methods—particularly those referred by CEE.

WG 14: Revision of Determination of Unsaponifiable Matter: Method II.D.5

In the absence of Prof. NAUDET (Chairman WG 14) Mr. WOLFF summarized his report. In response to Prof. PAQUOT's request it was decided that for the 4th Supplement (to 5th Edition) the test of the diethyl oxide method would be modified to include: (i) a correction regarding the acidity of the unsaponifiable extract; and (ii) a verification of the absence of unsaponifiable in the reagents and materials used.

For comparison between various methods it was decided to make new tests with methods already proposed (and one to be provided by Dr. K. A. WILLIAMS—the hexane method, 3 extractions with ethanol at 60°) using two French samples. It was requested that 5 determinations be made with each sample and all results sent to the coordinator Prof. NAUDET for statistical evaluation.

Prof. PAQUOT pointed out that if a decision had not been taken by next year the text of the method which will appear in the 6th Edition would be identical to that in the 4th Supplement to the 5th Edition and

that the text received subsequently would need to be issued as a Supplement to the 6th Edition.

WG 15: Determination of Acid Value

Drs. VOS distributed, during the meeting, documents which he had received regarding the determination of 'acid value' including comments on them and proposed that a small Working Group be set up to draw up the final report. This proposal was accepted and WG 15 set up.

4. Work Programme 1976-77

Prof. PAQUOT requested members of the various Working Groups to send their results to their respective Chairmen before 1 June 1977 who in turn should forward them to Prof. PAQUOT by 15 June 1977. It was hoped that this will enable IUPAC Secretariat to reproduce and distribute the documents to members before the next meeting of the Commission during the 29th IUPAC General Assembly (Warsaw: August 1977).

5. Publication of Standard Methods

Prof. PAQUOT pointed out that he was still waiting for proofs of 4th Supplement to the 5th Edition from Pergamon although they had been scheduled for June 1976. With regard to the 6th Edition, Prof. PAQUOT informed that no written comments had been received on the specimen method which had been circulated to members—not even on the flagrant error in the specimen. During the meeting members agreed to the presentation as in the sample.

Prof. PAQUOT noted that the methods in the 6th Edition were first drawn up in French and will be translated into English only later on and therefore suggested that the 6th Edition be initially published only in French. This proposal, agreed by members, will be sent to IUPAC Secretariat as well as the proposal of Dr. van der WEEL that Members should receive all publications of the Commission automatically.

6. Dates and Places of Future Meetings

The future meetings of the Commission were provisionally scheduled as follows:

- 1977—Warsaw, during 29th IUPAC General Assembly: August 1977
 1978—Louvain or Brussels, at the invitation of Belgian delegation
 1979—Switzerland, during 30th IUPAC General Assembly
 1980—France, at the invitation of French Commission on Oils and
 Fats and the Institut des Corps Gras.

C. PAQUOT

IUPAC COLLEAGUES DECEASED

We have been informed of the death of:

- | | |
|----------------|--|
| <i>Israel</i> | Dr. Ch. RESNICK (17 April 1977)—Section on Pesticides (1965–1975), Commission on Pesticide Residue Analysis (1965–). |
| <i>Japan</i> | Prof. T. MII (6 September 1976)—Commission on High Temperatures and Refractory Materials (1969–). |
| <i>Romania</i> | Prof. C. DRAGULESCU (1 June 1977)—Romanian Delegation to 24th, 25th, 26th, 27th and 28th IUPAC Council Meetings (1967, 1969, 1971, 1973, 1975) |
| <i>USA</i> | Prof. E. K. PLYLER (8 May 1976)—Commission on Molecular Structure and Spectroscopy (1959–1963), Sub-Commission on Infrared Intensity Standards (1963–1965) |

FORTHCOMING IUPAC-SPONSORED SYMPOSIA

IX INTERNATIONAL SYMPOSIUM ON CARBOHYDRATE CHEMISTRY

London, 10-14 April 1978

The next International Symposium on Carbohydrate Chemistry, sponsored by IUPAC, will take place in London, UK. The meeting is being organized by the Perkin Division and the Carbohydrate Group of the Chemical Society. The venue for the Symposium will be the Institute of Education (University of London), in London's Bloomsbury district. Single and double room reservations have been made in modern halls of residence close to the Institute of Education. All business of the Symposium will be conducted in English.

Scientific Programme

The symposium has been organized with the following themes in focus:

(i) Industrial uses of carbohydrates, including their use as enzyme substrates; (ii) Chemistry of carbohydrates in food, flavours etc.; (iii) Synthesis, including photochemical methods; (iv) Stereochemical and mechanistic aspects of carbohydrate reactions; (v) Physico-chemical aspects; (vi) Degradative reactions of carbohydrates; (vii) Analysis of carbohydrates; (viii) Medical aspects of carbohydrates; (ix) Structural and biological aspects of polysaccharides, glycoproteins and glycolipids.

The following persons have accepted invitations to give plenary lectures:

J. G. MOFFATT (USA)	N. SHARON (Israel)
C. PEDERSEN (Denmark)	V. SHIBAEV (USSR)
A.S. PERLIN (Canada)	P. SINAY (France)
R. S. SHALLENBERGER (USA)	S. UMEZAWA (Japan)

Haworth Memorial Lecture of the Chemical Society will be presented at the Symposium by R. U. LEMIEUX (USA); Tate and Lyle Lecturer had not yet been appointed at the time of going to press.

Plenary lectures will be published in *Pure and Applied Chemistry*, the official journal of IUPAC, and also possibly made available as a separate Symposium Volume by Pergamon Press.

Short contributed papers relating to the themes of the Symposium are invited from intending participants, who after being informed of acceptance of their paper will be required to send an Abstract in the required format for publication in the book of Abstracts. These books will be distributed to the participants at the meeting.

It is planned to make arrangements for a contributor's work to be displayed in the form of a poster. This will apply to contributions presented orally as well as to those presented only in poster form. It would help the programme committee if prospective contributors were to indicate when submitting their synopsis whether they wish to present their paper only as a poster.

Correspondence

Enquiries and correspondence concerning the Symposium should be addressed to:

Dr. J. F. GIBSON
The Chemical Society
Burlington House
London W1V 0BN, UK

SYMPOSIUM ON IONS AND ION PAIRS AND THEIR ROLE IN CHEMICAL REACTIONS

Syracuse, N.Y., 31 May-2 June 1978

This IUPAC sponsored Symposium will be organized under the auspices of the US National Science Foundation and College of Environmental Science and Forestry of the State University of New York at Syracuse, N.Y., USA. The Symposium will be held at the Hotel Syracuse where meeting rooms and a block of rooms for the accommodation of participants have been reserved at concessional rates.

Scientific Programme

The Scientific Programme will cover the following three topics:

- I. Structure, energetics and dynamics of ions and ion pairs, and their coordination complexes with solvent and ion-coordinating ligands
- II. Ion-binding ligands, their design and properties
- III. Reactivities and stereochemical effects of ion pairs and their solvation complexes.

The following scientists have agreed to give main lectures on these topics:

Topic I

E. de BOER
E. GRÜNWALD
P. KEBARLE
N. VELTHORST
A. PERSOONS

Topic II

E. M. ARNETT
D. J. CRAM
J. M. LEHN
A. POPOV

Topic III

L. M. DORFMANN
T. E. HOGEN ESCH
A. LEDWITH
C. D. RITCHIE
J. SMID
M. SZWARC

Main lectures will be published in *Pure and Applied Chemistry*, the official journal of IUPAC and also possibly made available as a separate Symposium Volume by Pergamon Press.

Time will be allocated for contributed short communications (15 min each) and those of the intending participants who would like to present a paper should submit the title and abstract no later than 1 February 1978.

Correspondence

Enquiries and correspondence concerning the Symposium should be addressed to:

Dr. P. CALUWE, Secretary
Symposium on Ions and Ion Pairs
Chemistry Department
State University of New York
College of Environmental Science and Forestry
Syracuse, NY 13210, USA

VI INTERNATIONAL CONFERENCE ON NON-AQUEOUS SOLUTIONS

Waterloo, 7-11 August 1978

This biennial Conference, sponsored by IUPAC, will be held in Waterloo, Ontario, Canada under the Chairmanship of Prof. W. A. E. McBRYDE. The Conference is of interest and value to preparative inorganic chemists, physical and theoretical chemists, and those analytical chemists working in solvents other than pure water. The Conference is timed to occur in the week adjacent to the Gordon Conference on Water, so that participants might be able to attend both events.

The venue of the Conference and accommodation will be at the Campus of the University of Waterloo. Waterloo is 70 miles (110 km) west of Toronto. Arrangements for the participants to travel from Toronto International Airport to the Conference Centre will be made.

Scientific Programme

Focus will be on the properties and role of the solvent as these affect chemical reactions. The following themes will be featured: (i) Preparative chemistry and solvent systems; (ii) Solvent effects on reactivity and mechanism; (iii) Thermodynamic properties of non-aqueous solutions; (iv) Electrochemistry in non-aqueous solutions; (v) Theory of liquids and solutions.

The following lecturers have so far accepted invitations to present plenary lectures:

S. AHRLAND (Sweden)

E. F. CALDIN (UK)

J. BARTHEL (FRG)

R. J. GILLESPIE (Canada)

In addition to these plenary lectures there will be both invited section lectures (40 min) and contributed papers (20 min). Abstracts of contributed papers should be submitted to the organizers no later than 31 January 1978. Plenary and selected invited lectures will be published in the IUPAC journal *Pure and Applied Chemistry* and possibly also as a separate Conference Volume by Pergamon Press.

Correspondence

Enquiries and correspondence concerning the Conference should be addressed to:

Prof. D. E. IRISH, Conference Secretary
Department of Chemistry
University of Waterloo
Waterloo, Ontario, Canada N2L 3G1

INTERNATIONAL CONFERENCE ON APPLICATIONS OF MÖSSBAUER EFFECT

Kyoto, 28 August–1 September 1978

This Conference sponsored jointly by IUPAC and International Union of Pure and Applied Physics will be held at the Kyoto International Conference Hall, Kyoto, Japan. The working language of the Conference will be English for oral presentation, Book of Abstracts and Proceedings. Concessional group flights will be arranged from USA and Europe. Contact should be made with the following in this regard:

- (a) Convention Coordinator, Japan Air Lines, American Region Executive Office, 655 Fifth Avenue, New York, N.Y. 10022, USA. Tel. 212-758-8850
- (b) Deutsches Reisbüro GmbH, Eschersheimer Landstrasse 25-27, 6000 Frankfurt/Main (FRG). Tel. 0611-15661

Prof. R. H. HERBER (Rutgers University, N.J., USA) and Prof. U. GONSER (Universität des Saarlandes, Saarbrücken, FRG) will act as the Key persons in the USA and Europe, respectively.

Scientific Programme

The scientific programme will include oral presentations of invited and contributed papers and possibly poster sessions. The themes of the Conference will be tentatively: (i) After effects in nuclear transformations; (ii) Amorphous materials; (iii) Biological systems and model compounds; (iv) Chemical structure and bonding; (v) Earth science and archeology; (vi) Electronic structure in magnetic materials; (vii) Engineering materials; (viii) Lattice dynamics, phase transitions and critical phenomena; (ix) Magnetic hyperfine interactions; (x) Metals and alloys; (xi) Progress in methodology; (xii) Radiation damage and defect structure; (xiii) Surface phenomena and catalysis.

Abstracts of invited lectures and all accepted contributions will be printed in a Book of Abstracts which will be distributed to participants at the Conference. It is planned to publish the Proceedings of the

Conference in a supplement to the *Journal de Physique* after the Conference.

Correspondence

Enquiries and correspondence concerning the Conference should be addressed to:

Prof. F. E. FUJITA
General Secretary
International Conference on the Applications of
Mössbauer Effect
c/o Kyoto International Conference Hall
Takaraike Sakyo-ku, Kyoto 606, Japan

XIX INTERNATIONAL CONFERENCE ON COORDINATION CHEMISTRY

Prague, 4-8 September 1978

The next International Conference on Coordination Chemistry will be held in Prague, sponsored by IUPAC and by Chemical Institutes of the Czechoslovak and Slovak Academy of Sciences with other relevant organizations in Czechoslovakia. The location of the Conference will be in the area of the Technical University in Prague-Dejvice. Accommodation will be available through the Čedok-Congress Centre, Na Příkopě 18, 111 35 Prague 1, as well as in the university dormitory in the campus of the Agricultural University (about 5 km from Conference site). Since no translation facilities will be provided the speakers should choose the language understood by the majority of the participants, preferably English; the same applies to Abstracts.

Scientific Programme

The Conference will be concerned with recent developments of coordination chemistry with emphasis on the following topics: (i) Reactions of coordination compounds (especially redox, photochemical and radical reactions); (ii) Confrontation of experimental results with theoretical description of coordination compounds; (iii) Chemistry of metal cluster compounds; (iv) Role of complexes in catalytic processes (including

both technological and biological aspects); (v) Chemistry of coordination compounds in solid state; (vi) Equilibrium of coordination compounds in non-aqueous media; (vii) Bio-inorganic chemistry.

Plenary lectures will be presented by the following speakers:

Prof. V. GUTMANN (Austria)

Prof. L. MARKÓ (Hungary)

Prof. J. HALPERN (USA)

Prof. V. I. NEFEDOV (USSR)

Prof. I. H. HILLIER (UK)

The plenary lectures will be published in *Pure and Applied Chemistry*, the official journal of IUPAC and may possibly be made available as a separate Conference Volume by Pergamon Press.

In addition, 20 section lectures (30 min each) will be presented by invited speakers to survey, together with the plenary lectures, different specific fields of coordination chemistry. All *new* research and data will be presented in the form of poster sessions which are intended to substitute the usual oral short communications. The way of presenting the results in the form of posters is left to the author, however, it is recommended to make the poster visually attractive graphically emphasizing the title and the most important results and be legible from a longer distance. It is also recommended to the authors to bring with them several copies of full texts of their contributions for distribution amongst the most interested participants.

Microsymposia and Panel Discussions

It is proposed to have several Microsymposia and Panel Discussions. The following topics have been selected for the Microsymposia: (i) Boranes as ligands; (ii) Reactivity of coordinated NO group; (iii) Adducts of dioxygen with bioanalogous substrates; (iv) Electrochemical properties and structure of coordination compounds; (v) Use of coordination compounds in chemotherapy; (vi) Properties of coordination compounds in solid state—influence of Jahn Teller effect; (vii) Some aspects of homogeneous catalysis.

Panel Discussions are proposed to be organized on the following topics: (i) Bio-coordination chemistry; (ii) Coordination in reaction mechanisms; (iii) Critical evaluation of theoretical methods used in coordination chemistry; (iv) Prebiotic aspects of coordination chemistry.

Correspondence

Enquiries and correspondence concerning the Conference should be addressed to:

Secretariat of XIX ICCC
J. Heyrovský Institute of Physical Chemistry
and Electrochemistry
Czechoslovak Academy of Sciences
Vlašská 9
118 40 Prague 1, Czechoslovakia

XI INTERNATIONAL SYMPOSIUM ON CHEMISTRY OF NATURAL PRODUCTS

Golden Sands/Varna, 17-23 September 1978

The Eleventh Symposium on the Chemistry of Natural Products sponsored by IUPAC, will be held at the Golden Sands resort (about 18 km from Varna) on the Black Sea under the auspices of Bulgarian Academy of Sciences. Accommodation will be available in luxury and first class hotels as well as in private boarding houses. Bus transportation will be provided. The official language of the Symposium will be English; no simultaneous translation facilities will be provided.

Scientific Programme

The Scientific Programme will include papers of special interest and novelty in Natural Products Chemistry within the following areas:

I. *Bioorganic Chemistry*

- (a) Nucleic acids, nucleotides, proteins, enzymes, hormone receptors
- (b) Biogenesis, biosynthesis, biosystematics (chemotaxonomy)
- (c) Plant activators and inhibitors, hormones, antibiotics and pheromones

II. *Structural Elucidation and Chemical Transformations of Natural Products*

- (a) Alkaloids
- (b) Isoprenoids
- (c) Polyphenols
- (d) Lipids, Carbohydrates

III. *Synthesis of Natural Products*

IV. *Physical Methods for Investigation of Natural Products*

The following scientists have accepted invitations to deliver plenary lectures:

A. BROSSI (USA)	R. SCHWYZER
T. KAMETANI	G. SNATZKE
G. KIRBY (UK)	B. TROST
K. NAKANISHI	M. V. VOL'KENSHTAIN
G. OURISSON (France)	R. WEICHERT (FRG)
Yu. A OVCHINNIKOV (USSR)	K. WIESNER

The plenary lectures will be published in *Pure and Applied Chemistry*, the official journal of IUPAC. They may also be made available in a specially bound symposium volume by Pergamon Press.

Correspondence

Enquiries and correspondence concerning the Conference should be addressed to:

Dr. R. VLAHOV
Secretary, Symposium Committee
XI IUPAC Symposium on Chemistry of Natural Products
c/o Institute of Organic Chemistry with Center of
Phytochemistry, Bulgarian Academy of Sciences
1113 Sofia, Bulgaria

INTERNATIONAL SYMPOSIUM ON MACROMOLECULAR CHEMISTRY

Tashkent, 17-21 October 1978

An International Symposium on Macromolecular Chemistry, sponsored by IUPAC will be held under the auspices of USSR Academy of Sciences in Tashkent. The travel and accommodation of participants from outside USSR will be handled by 'Intourist'. The official languages of the Symposium will be English and Russian. It would be advisable for speakers to use one of these languages which are understood by most participants, though the speakers may also use other languages. Simultaneous translation from one official language into the other will be provided only for the plenary and main lectures.

Scientific Programme

The Scientific Programme will cover following aspects of macromolecular chemistry: (i) Synthesis of new polymers; (ii) New aspects in reaction mechanisms of polymer synthesis; (iii) New areas in the chemical reactions of polymers; (iv) Structure and properties of polymers and their solutions; (v) Fundamental approaches for producing polymer composites; (vi) Cellulose and its derivatives.

The following scientists have accepted invitations to present plenary lectures:

K. ANDRIANOV (USSR)	Achievements in the field of organo-element high molecular compounds
P. FLORY (USA)	Structure, conformation and properties of macromolecules
J. FURUKAWA (Japan)	Recent development on alternating copolymerization
H. KLARE (GDR)	Properties and structure of polyalkylene-terephthalates
H. MARK (USA)	Polymers for extreme service conditions
G. SMETS (Belgium)	Dissociation and recombination reactions in solid polymers

Plenary and main speakers will be given an opportunity to publish the texts of their papers in the *Journal of the Academy of Sciences of the USSR Vysokomolekulyarnye Soyedineniya* (in Russian) and in the *Journal of Polymer Science*. Those who wish to publish their papers in the two journals should submit four copies of the paper in English. Speakers who wish to publish their lectures in only one of the above-mentioned journals are requested to inform the Organizing Committee of the Symposium and to present three copies of the text.

Participants who wish to present short communications (10 min) should submit abstracts of their communications typed in accordance with the requirements of the Organizers (see below for address).

Correspondence

Enquiries and correspondence concerning the Symposium should be addressed to:

Organizing Committee
International Symposium on Macromolecular Chemistry
Vavilova Street 32
117312 Moscow V-312, USSR
Telephone: 135-98-82

27th IUPAC CONGRESS

Helsinki, 27-31 August 1979

The Congress will be held in Finlandia Hall under the auspices of Suomen Kemian Seura with Prof. H. SUOMALAINEN as the President of the Congress. Economic trips are being prepared by the Organizers and further information will be sent on request. The working language of the Congress will be English and no simultaneous translations are offered.

Scientific Programme

The programme has been planned to include the following main sections and subsections:

- I. *Trace Element Analysis* (Chairman: Prof. O. MÄKITIE)
 - (a) Agricultural and food chemistry
 - (b) Biological and clinical chemistry
 - (c) Environmental chemistry
 - (d) Geochemistry
 - (e) Instrumental techniques in trace element analysis

- II. *Modern Methods in Clinical Chemistry*
(Chairman: Prof. H. ADLERCREUTZ)
 - (a) Competitive binding assays
 - (b) Enzymatic kinetic methods for non-enzymatic components
 - (c) Analysis of tissue specimens by ultramicro methods
 - (d) Gas chromatography, mass spectrometry and electron spin resonance in clinical chemistry

- III. *Chemistry and Biology of Cell Membrane Carbohydrates*
(Chairman: Prof. J. JÄRNEFELT)
 - (a) Symposium on structure and analysis of complex oligo-saccharides
 - (b) Analytical developments in the determination of structures of complex carbohydrates
 - (c) Biological functions of membrane carbohydrates
 - (d) Purification of membrane glycoproteins

IV. *Chemistry and Technology of Natural Polymers and their Degradation Products* (Chairman: Prof. E. SJÖSTRÖM)

- (a) Cellulose
- (b) Starch
- (c) Other polysaccharides
- (d) Lignin
- (e) Other phenolic polymers
- (f) Physical characterization of natural polymers

V. *Biotechnology and Bioengineering*

(Chairman: Prof. M. LINKO)

- (a) Industrial production of enzymes
- (b) Biotechnology in pulp and paper industry
- (c) Design and operation of fermentors
- (d) Mathematical models of fermentation processes

VI. *Mineral Resources in Northern Europe*

(Chairman: Dr. H. WENNERVIRTA)

Six plenary and 24 main lectures will be given by invited speakers. A large number of contributed papers, which any participant may submit, will be accepted. On the basis of the abstracts, the organizers will decide which of the papers conveniently fit together as a thematic group to be presented orally and which will be given in poster sessions. Participants of the Congress will receive a booklet containing abstracts of the papers. The organizers will be happy to consider proposals for additional subsections. The plenary and invited lectures will be published in *Pure and Applied Chemistry*, the official journal of IUPAC, and also made available as a special bound volume by Pergamon Press.

Correspondence

Enquiries and correspondence concerning the Congress should be addressed to:

Dr. J. LARINKARI
27th IUPAC Congress
POB 13244
SF-00131 Helsinki 13, Finland
Telephone: 90-17 44 15
Cable: Finncongress

WORLD DATA REFERRAL CENTRE

The Committee on Data for Science and Technology (CODATA) has recently established a World Data Referral Centre (WDRC). The Centre will seek to give guidance to data users on the availability and sources of the data they need. 'Referral' is the process of redirecting an inquiry for information to appropriate sources which can provide an answer. In the present context, it implies the identification of a source of reliable numerical data which can help the inquirer. The Centre is intended to provide a worldwide focus on referral activities, and to improve all capabilities to answer scientific and technical questions, *especially those involving data*.

WDRC is now working—with the help of CODATA members in several countries—to prepare a Master List of referral resources with emphasis on *numerical data* resources. When this list has been assembled, WDRC will begin actively to communicate with local, regional and national referral organizations throughout the world.

Functions

The Centre's functions will include:

- (a) Collecting information concerning major resources of data and related scientific information on a worldwide basis and constructing a file of this material for convenient retrieval;
- (b) Preparing and disseminating documents to assist local and national services to conduct data referrals;
- (c) Provide advice to local and national services on problems of data referral;
- (d) Performing data referrals on request from national and local services and, when necessary, from individual inquirers.

Subjects and Kind of Information Available

The subjects covered by the Centre include physics, chemistry, the biological sciences, the geosciences, and related fields in engineering and technology.

WDRC emphasizes *data*, and will try to maintain a comprehensive awareness of available *data* resources, but recognizes that data are not

independent of or separable from other kinds of scientific information. If no specific *data* source can be identified in response to a user's inquiry, referral to another general information source on the same subject may be the most helpful referral service possible: abstracting and indexing services, names of experts and laboratories in various scientific and technological specialities, and other resources.

Relationships with National and Regional Organizations

Most libraries recognize referral as an important part of their work. Some information services are concerned primarily or exclusively with referral. The French S.O.S. Doc and US National Referral Center are examples. WDRC does not seek to replace these existing functions but is planned as a back-up centre. Local and national referral services will be invited to use WDRC to help them perform their own work better.

It is intended that the Centre will work closely with other international information and referral organizations (such as AGRIS, INIS, etc.) in such a way that the other organizations supplement their own capabilities and exchange resources so that all can do a better job in serving their users.

Modus Operandi

Referral service will be available without charge to any organization or individual working in any relevant field. No special forms are required, but the Centre can make its replies more effective if the inquirer presents precise statements of:

- (i) The Information Desired and Aim of the Inquiry. A request submitted in clear, precise terms will make it possible to select the most specifically pertinent resources.
- (ii) Information Resources Already Queried. To avoid being referred to resources already known to him, the inquirer should tell the Centre what resources he is already familiar with.

Location

The World Data Referral Centre is located at 51 Boulevard de Montmorency, 75016 Paris, France [Telephone: (01) 224-9090. Telex: ICSU 630553 F]. Visits by those interested in its functions or services are welcome on weekdays between 9.00 a.m. and 5.00 p.m.; appointments should be arranged in advance by telephone or letter.

CALENDAR OF IUPAC-SPONSORED MEETINGS

1978

February 13-17	UNESCO International Congress on Laboratory Courses in Chemistry in Universities (Prof. A. R. H. COLE, School of Chemistry, University of Western Australia, Nedlands, Western Australia)	Perth (Australia)
March 9-10	International Symposium on Harmonisation of Collaborative Analytical Studies (Dr. H. EGAN, Laboratory of the Government Chemist, Cornwall House, Stamford Street, London SE1 9NQ, UK)	London (UK)
April 10-14	IX International Symposium on Carbohydrate Chemistry (Prof. W. G. OVEREND, Chairman of Organizing Committee, Department of Chemistry, Birkbeck College, Malet Street, London WC1E 7HX, UK)	London (UK)
May 31 - June 2	International Symposium on Ions and Ion Pairs and their Role in Chemical Reactions (Prof. J. SMID, College of Environmental Science and Forestry, Syracuse Campus, Syracuse, New York 13210, USA)	Syracuse, N.Y. (USA)
June 5-9	III International Symposium on Genetics of Industrial Microorganisms (Prof. D. PERLMAN, Chairman of Organizing Committee, School of Pharmacy, University of Wisconsin, Madison, Wisconsin 53706, USA)	Madison Wisconsin (USA)
July 10-13	World Conference on Future Sources of Organic Raw Materials (Chemical Institute of Canada, 906-151 Slater Street, Ottawa, Ontario, Canada K1P 5H3)	Toronto (Canada)
July 10-13	18th Prague Microsymposium on Macromolecules: Synthetic and Semisynthetic Polymer Catalysts and Affinates (Dr. P. ČEPELÍN, Scientific Secretary, PMM Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-162 06 Praha 616, Czechoslovakia)	Prague (Czechoslovakia)
July 17-21	6th Discussion Conference on Macromolecules: Chromatography of Polymers and Polymers in Chromatography (Dr. P. ČEPELÍN, Scientific Secretary, PMM Secretariat, Institute of Macromolecular Chemistry, Czechoslovak Academy of Sciences, CS-162 06 Praha 616, Czechoslovakia)	Prague (Czechoslovakia)
July 24-28	IV International Congress of Pesticide Chemistry (Dr. M. SPINDLER, Secretary, Scientific Programme Committee of Congress, POB 182, CH-4013, Basle, Switzerland)	Zürich (Switzerland)

July 24-28	VII IUPAC Symposium on Photochemistry (Prof. N. J. TURRO, Department of Chemistry, Columbia University, New York, New York 10027, USA)	Leuven (Belgium)
July 24-29	V International Symposium on Carotenoids (Dr. J. W. PORTER, Chairman of Organizing Committee, Department of Physiological Chemistry, University of Wisconsin Medical Center, 1215 Linden Drive, 589 Medical Sciences Building, Madison, Wisconsin 53706, USA)	Madison, Wisconsin (USA)
August 7-11	VI International Conference on Non-Aqueous Solutions (Prof. W. A. E. McBRYDE, Guelph-Waterloo Centre for Graduate Work in Chemistry, Department of Chemistry, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada)	Waterloo (Canada)
August 28 - September 1	8th International Conference on Applications of Mössbauer Effect (Prof. H. SANO, Department of Chemistry, Faculty of Science, Tokyo Metropolitan University, Setagaya-ku, Tokyo 158, Japan)	Kyoto (Japan)
September 4-7	VI International Symposium on Medicinal Chemistry (Trans World Conference Organisers Ltd., 31 Plane Tree Way, Woodstock, Oxford OX7 1PE, UK)	Brighton (UK)
September 4-8	IV IUPAC Conference on Physical Organic Chemistry (Dr. J. F. GIBSON, Conference Secretary, Chemical Society, Burlington House, Piccadilly, London W1V 0BN, UK)	York (UK)
September 4-8	XIX International Conference on Coordination Chemistry (Prof. A. A. VLČEK, Chairman, Organizing Committee, J. Heyrovský Institute of Physical Chemistry and Electrochemistry, Czechoslovak Academy of Sciences, Vlašská 9, 118 40 Prague 1, Czechoslovakia)	Prague (Czechoslovakia)
September 7-10	II International Symposium on Marine Natural Products (Prof. L. MINALE, Laboratorio per la Chimica di Molecole di Interesse Biologico, Via Toiario 2, Arco Felice, Napoli, Italy)	Sorrento Naples (Italy)
September 11-15	II IUPAC Conference on Organic Synthesis (Prof. S. SAREL, Chairman of Conference Organizing Committee, Department of Pharmaceutical Chemistry, Hebrew University School of Pharmacy, POB 12013, Jerusalem, Israel)	Jerusalem and Haifa (Israel)
September 11-15	IV International Conference on Solute-Solvent Interactions (Prof. P. SCHUSTER, Institut für Theoretische Chemie und Strahlenchemie der Universität, Wien, Wahringerstrasse 17, A-1090 Wien, Austria)	Vienna (Austria)
September 17-23	XI International Symposium on Chemistry of Natural Products (Dr. R. VLAHOV, Chairman of Symposium Committee, Institute of Organic Chemistry, Bulgarian Academy of Sciences, Sofia 1113, Bulgaria)	Varna (Bulgaria)

October 17-21	International Symposium on Macromolecular Chemistry (Prof. K. A. ANDRIANOV, Symposium Organizing Committee, Polymer Scientific Council, Academy of Sciences of USSR, Vavilov Street 32, 117312 Moscow, USSR)	Tashkent (USSR)
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1979

August 12-18	8th International Mass Spectrometry Conference (Dr. O. H. J. CHRISTIE, Laboratory for Mass Spectrometry, University of Oslo, PB 1048 Blindern, Oslo 3, Norway)	Oslo (Norway)
August 20-25	International Conference on Surface and Colloid Chemistry (Prof. S. FRIBERG, Department of Chemistry, 142 Chemistry Building, University of Missouri-Rolla, Rolla, Missouri 65401, USA)	Stockholm (Sweden)
August 27-31	27th IUPAC Congress (Dr. J. LARINKARI, Kenian Helsinki Keskusliitto, POB 13028, Fabianinkato 7B, SF-00131 Helsinki 13, Finland)	Helsinki (Finland)
September 17-21	International Symposium on Macromolecules (Prof. R. C. SCHULZ, Organisch-Chemisches Institut, J.J. Becherweg 18-20, D-6500 Mainz, Federal Republic of Germany)	Mainz (FRG)

1980

August 17-22	V IUPAC Conference on Physical Organic Chemistry (Prof. J. F. BUNNETT, Chairman of Organizing Committee, Division of Natural Sciences - II, University of California, Santa Cruz, California 95064, USA)	Santa Cruz, California (USA)
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CALENDAR OF NON-IUPAC MEETINGS

1978

March 13-15	5th International Symposium on Chemical Reaction Engineering (Prof. D. LUSS, Department of Chemical Engineering, University of Houston, Texas 77004, USA)	Houston, Texas (USA)
May 22-25	6th International CODATA Conference (CODATA Secretariat, 51 Boulevard de Montmorency, 75016 Paris, France)	Taormina (Italy)
July 2-7	4th International Meeting on NMR Spectroscopy (Dr. J. F. GIBSON, The Chemical Society, Burlington House, Piccadilly, London W1V 0BN, UK)	York (UK)
July 2-8	12th Meeting of Federation of European Biochemical Societies (FEBS) (Secretariat, 12th FEBS Meeting, POB 313, 806 Dresden, German Democratic Republic)	Dresden (DDR)
July 10-14	7th International Symposium on <u>Continuous</u> Cultivation of Microorganisms [Secretariat of the 7th International Symposium on Continuous Cultivation of Microorganisms, Institute of Microbiology, Czechoslovak Academy of Sciences, Budejovická, 1081, CS-14220 Prague 411 (Horní Krc), Czechoslovakia]	Prague (Czechoslovakia)
August 3-12	11th General Assembly of IUCr and International Congress of Crystallography (11th ICCr, Institute of Physics, Polish Academy of Science, A1. Lotnikow 32/46, Pawilan 9, Poland)	Warsaw (Poland)
September 25-29	12th International Symposium on Chromatography (Gesellschaft Deutscher Chemiker, POB 900440, D-6000 Frankfurt/Main 90, Federal Republic of Germany)	Baden-Baden (FRG)
September 25-30	2nd European Conference on Organometallic Chemistry 'Stereochemical Aspects of Organometallic Reactions' (Prof. H. LEHMKUHL, Max-Planck-Institut für Kohlenforschung, POB 011325, D-4330 Mulheim a.d. Ruhr 1, Federal Republic of Germany)	Hamel (FRG)
October 4-11	7th International Congress on Metallic Corrosion (Associação Brasileira de Corrosão-ABRACO, Edifício do I.N.T., Av. Venezuela 82/709, 20 000 Rio de Janeiro-RJ, Brazil)	Rio de Janeiro (Brazil)

LIST OF ABBREVIATIONS

AOAC	Association of Official Analytical Chemists
CAS	Chemical Abstracts Service
CBN	IUPAC-IUB Commission on Biochemical Nomenclature
CEBJ	Commission on Editors of Biochemical Journals of IUB
CEE	Communauté Européenne Economique
CNIC	IUPAC Commission on Nomenclature of Inorganic Chemistry
CNOC	IUPAC Commission on Nomenclature of Organic Chemistry
CODATA	ICSU Committee on Data for Science and Technology
FAO	UN Food and Agriculture Organization
IAEA	International Atomic Energy Agency
ICSU	International Council of Scientific Unions
ICTA	International Confederation for Thermal Analysis
ISO	International Organization for Standardization
ISO/TC	ISO Technical Committee
IFCC	International Federation of Clinical Chemistry
IUB	International Union of Biochemistry
IUBS	International Union of Biological Sciences
IUCr	International Union of Crystallography
IUFoST	International Union of Food Science and Technology
IUNS	International Union of Nutritional Sciences
IUPHAR	International Union of Pharmacology
IUPAP	International Union of Pure and Applied Physics
OECD	Organization for Economic Cooperation and Development
SCOPE	ICSU Scientific Committee on Problems of the Environment
UN	United Nations
UNESCO	UN Educational, Scientific, and Cultural Organization
UNISIST	UNESCO-ICSU Programme on International Science Information System
WHO	UN World Health Organization
WPSPF	IUPAC Macromolecular Division Working Party on Supported Polymer Films

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